FIG. 1A.

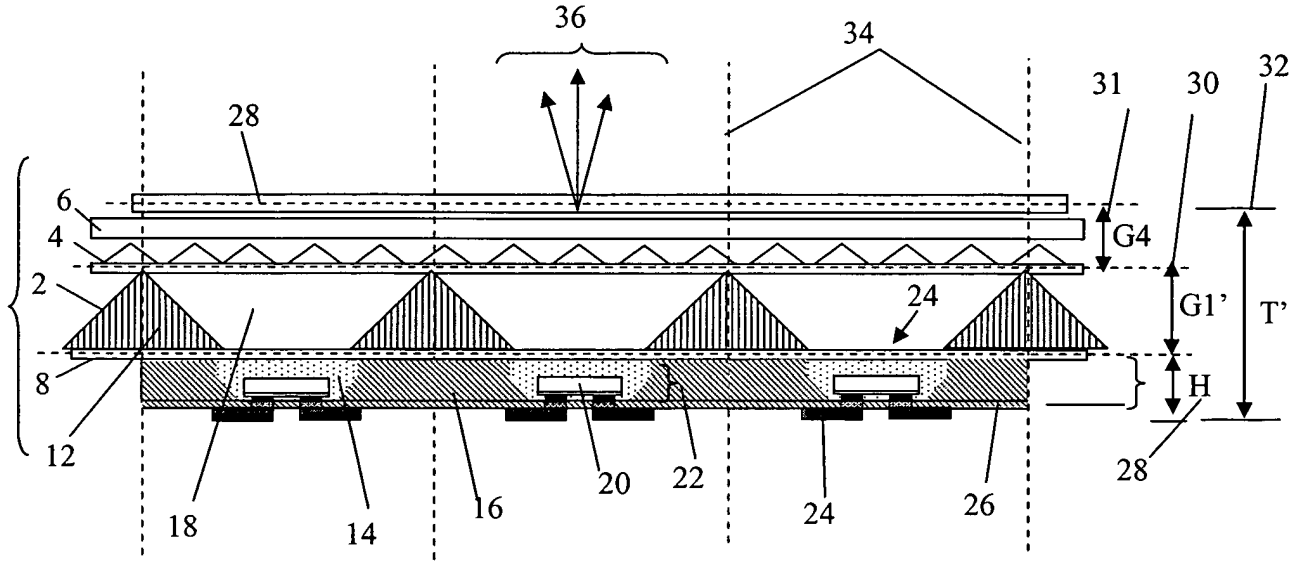

36
34
28
31
30
32
6
4
2
G4
G1'
T'
24
8
H
12
18
14
16
20
22
24
26
28

FIG 1B.

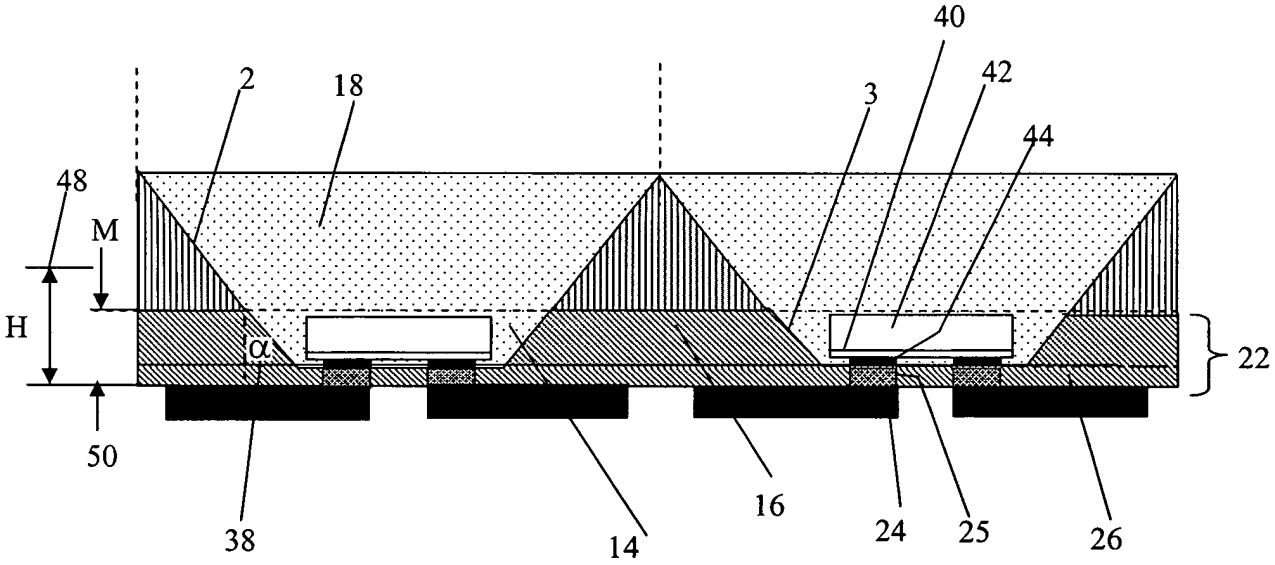

40
2
18
3
42
44
48
M
H
α
22
50
38
14
16
24
25
26

FIG. 2A.

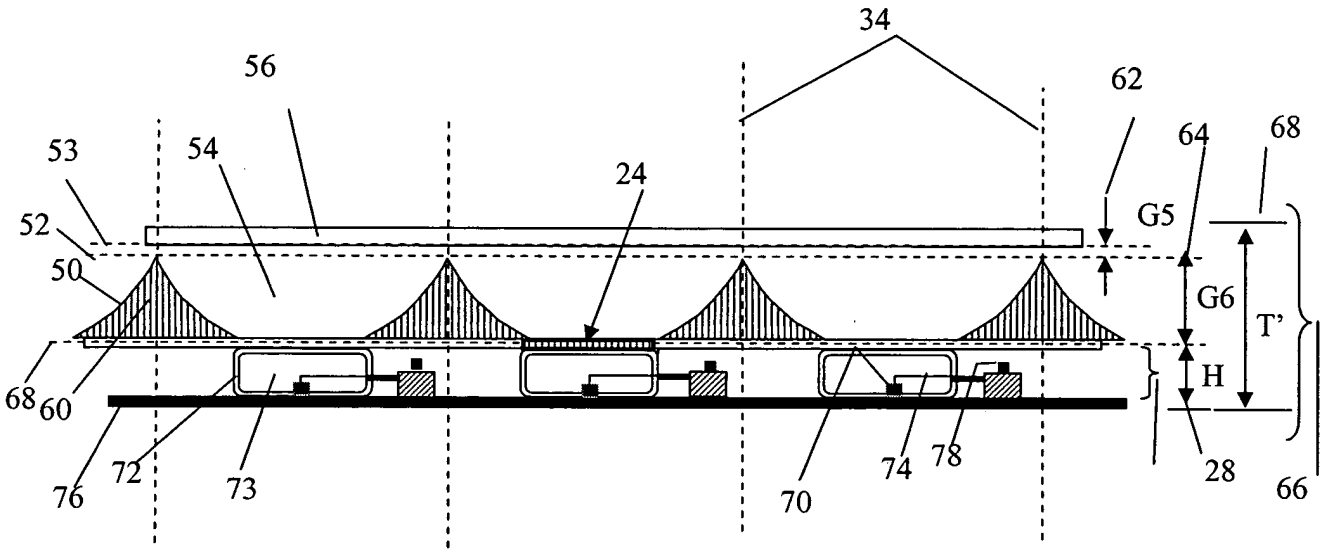


FIG. 2B

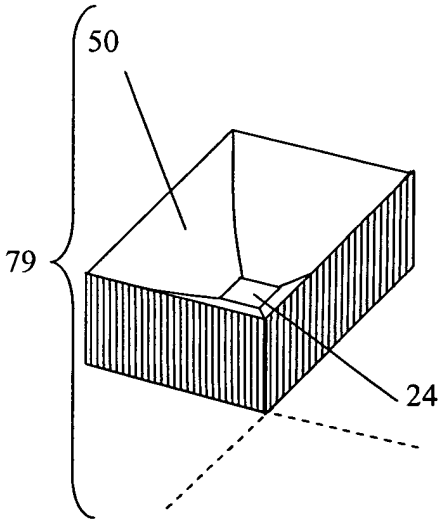


FIG. 2C.

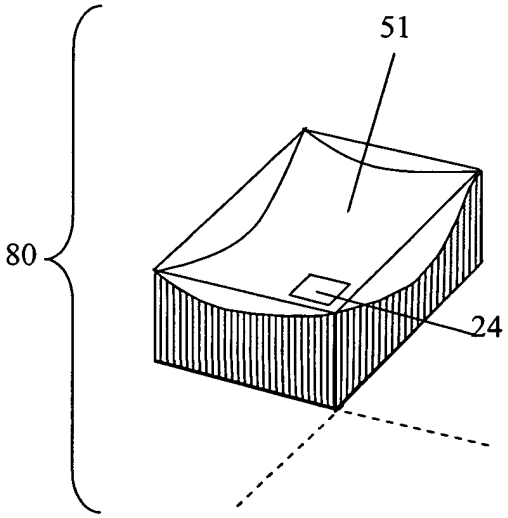


FIG. 3A

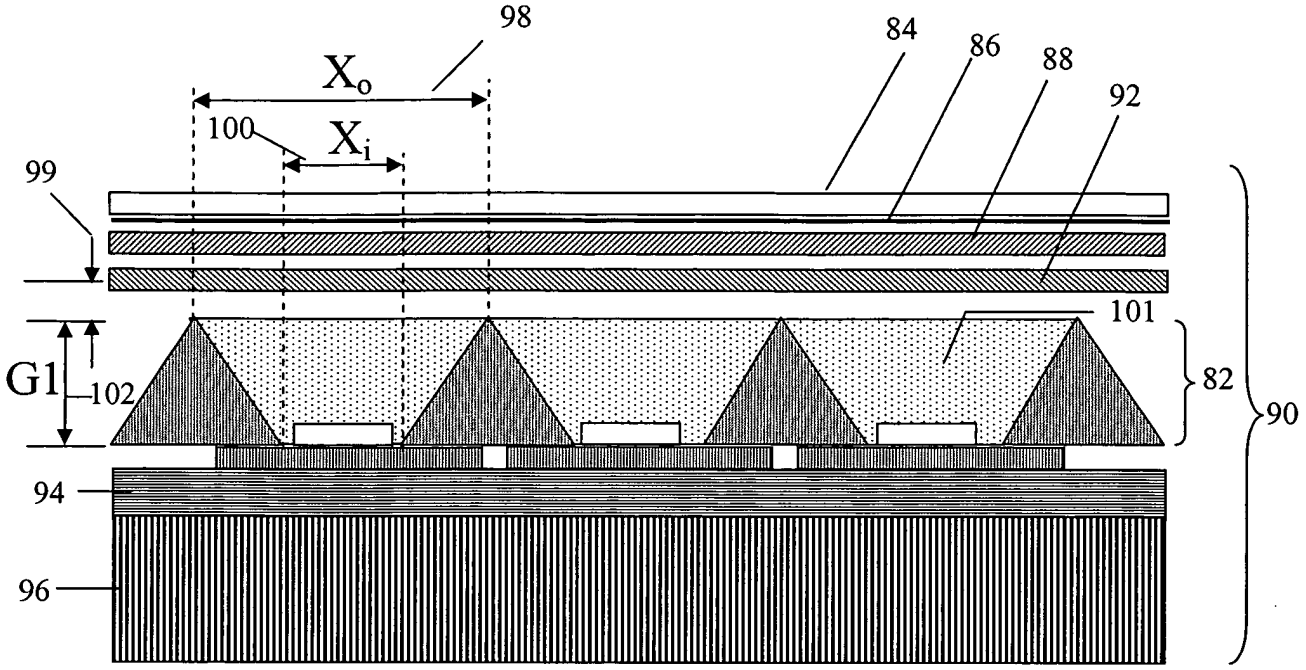

98
X_o
84
86
88
92
100
X_i
99
101
G1
102
82
90
94
96

FIG. 3B.

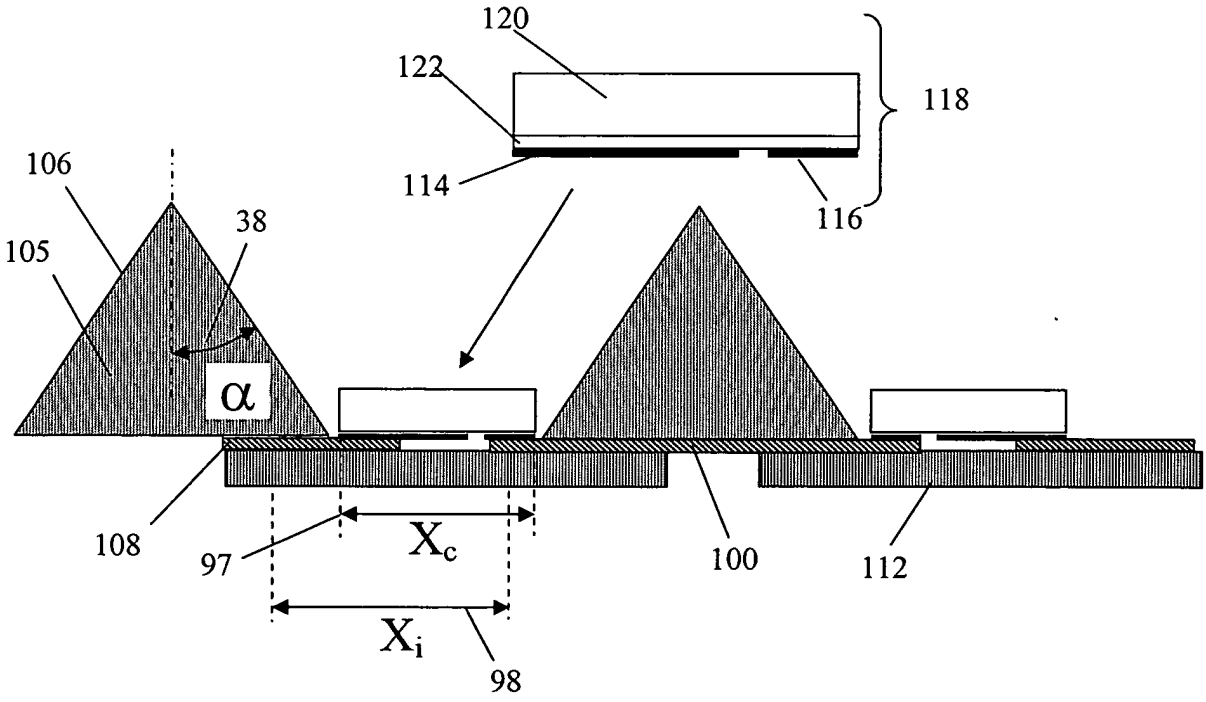

120
122
118
106
114
116
38
105
α
108
97
X_c
100
112
X_i
98

FIG. 4A.

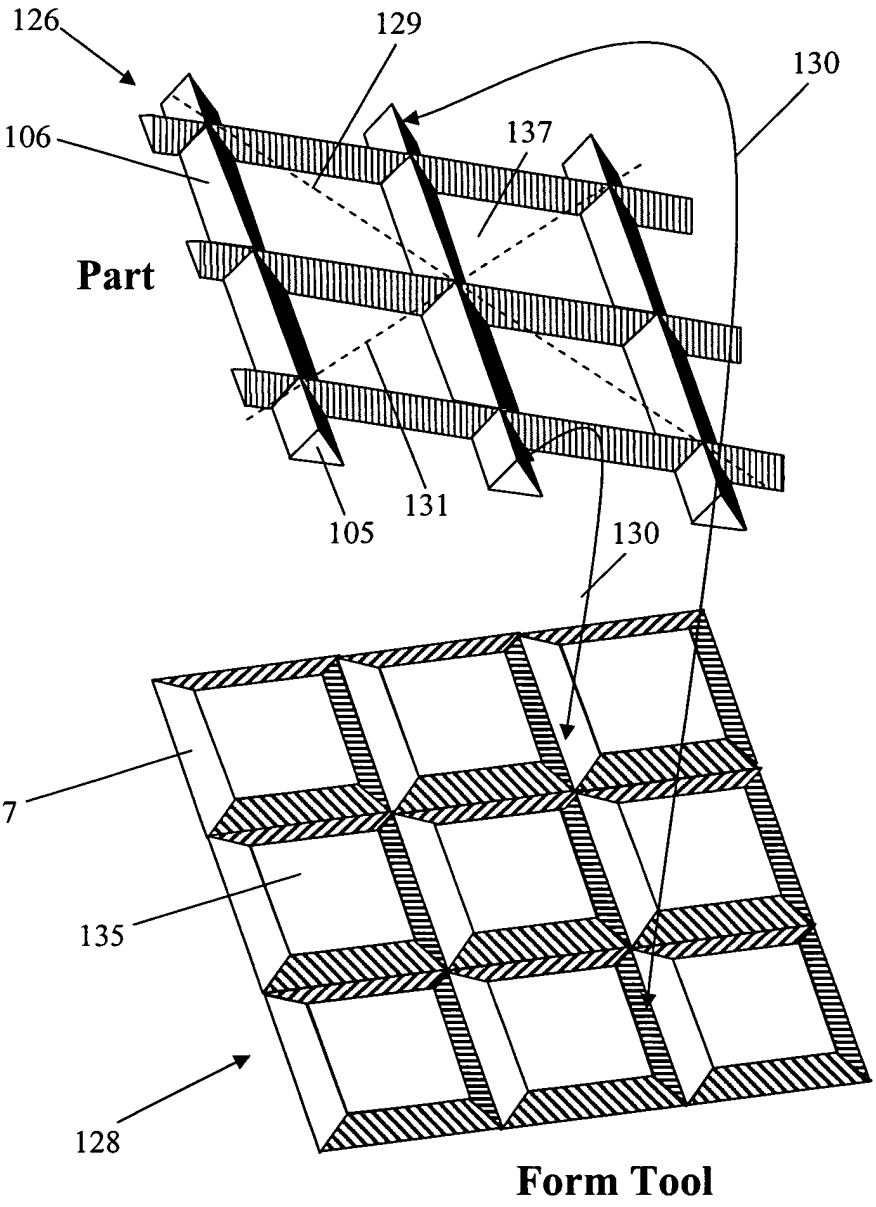
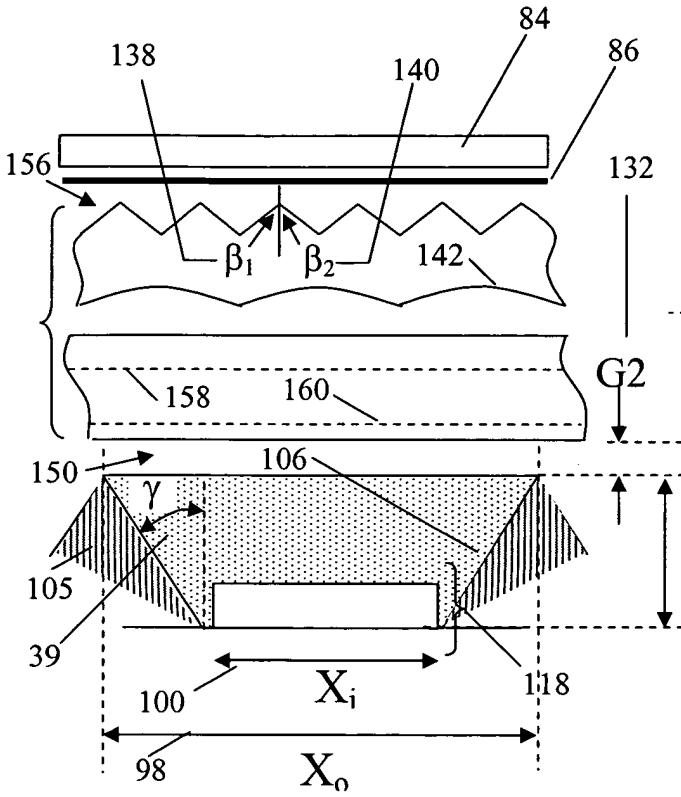


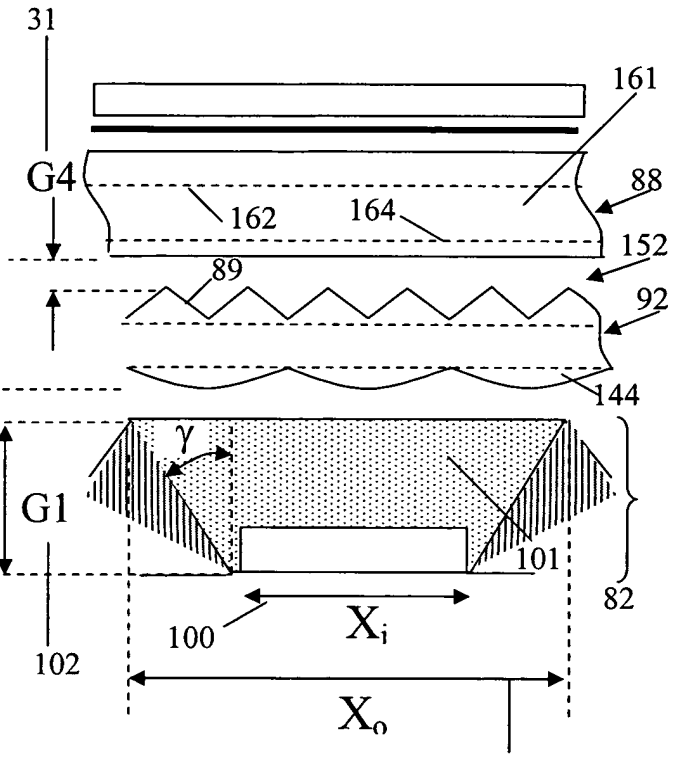
FIG. 4B.

FIG. 5A.



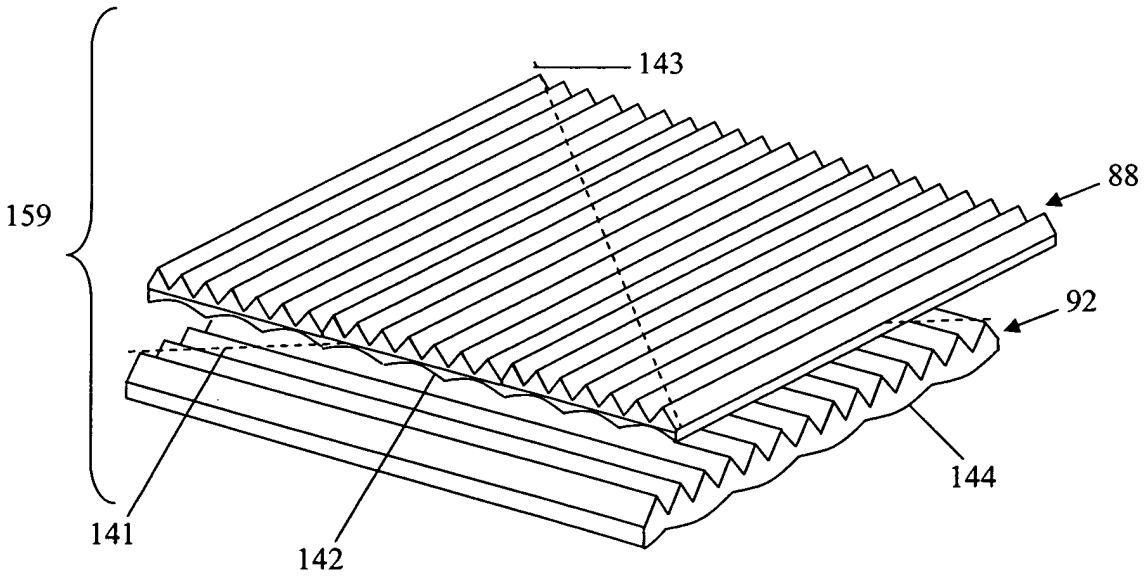
Front View

FIG. 5B.



Side View

FIG. 5C.



Perspective View

FIG. 6A

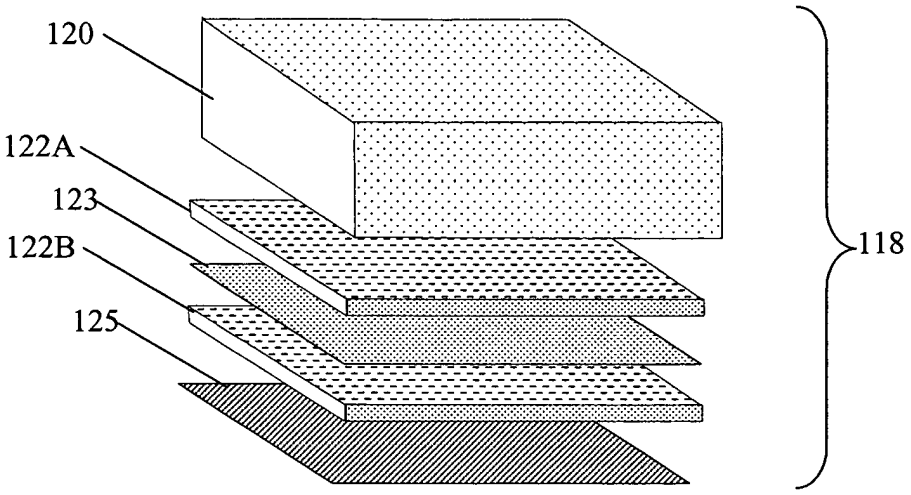


FIG. 6B

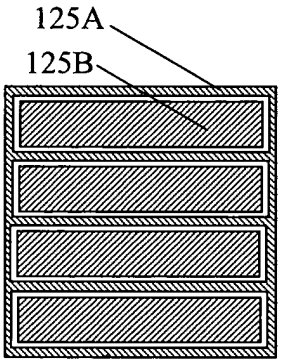


FIG. 6C.

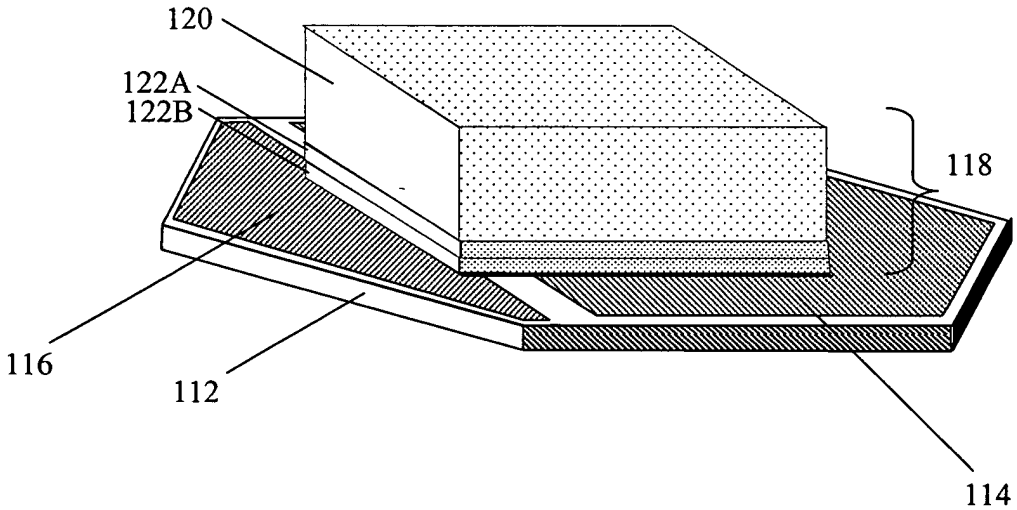


FIG. 7

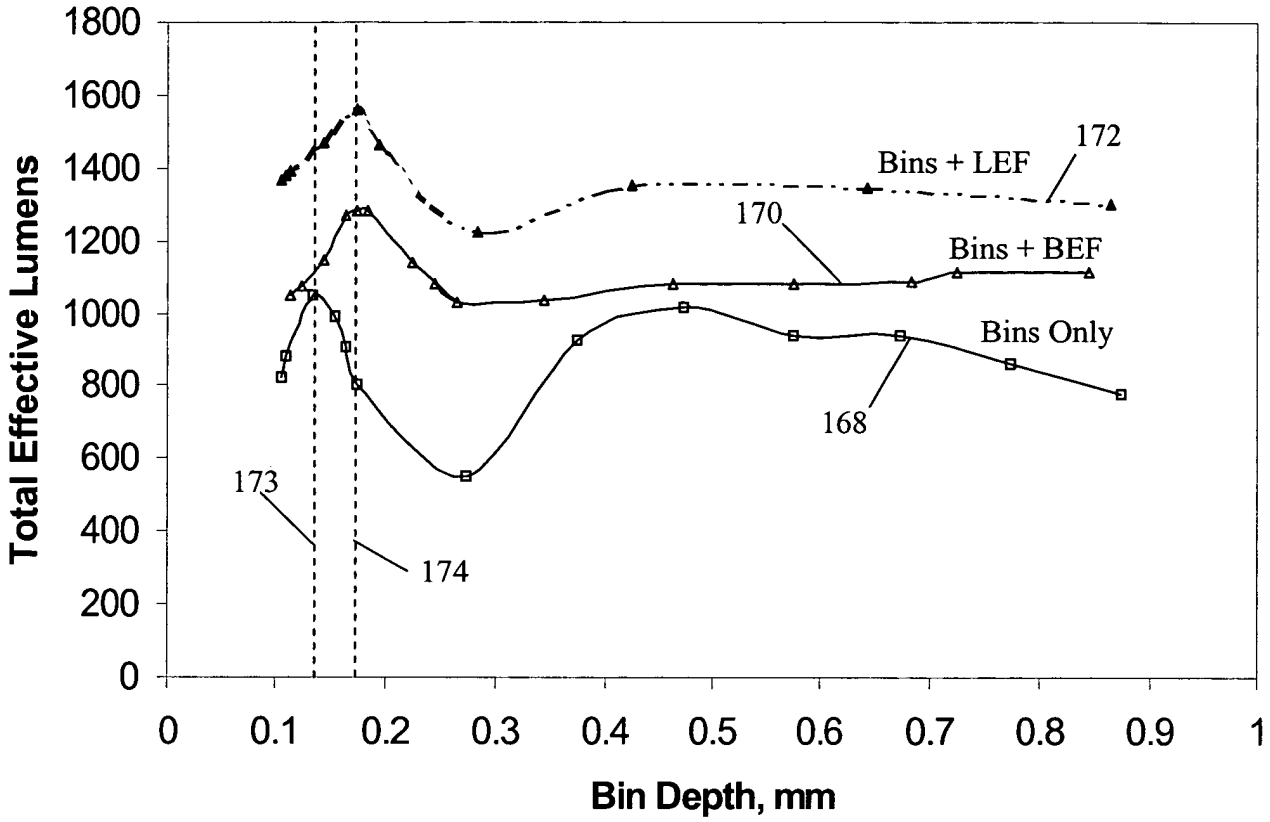

Total Effective Lumens
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Bin Depth, mm
Bins + LEF
172
170
Bins + BEF
Bins Only
168
173
174

FIG. 8

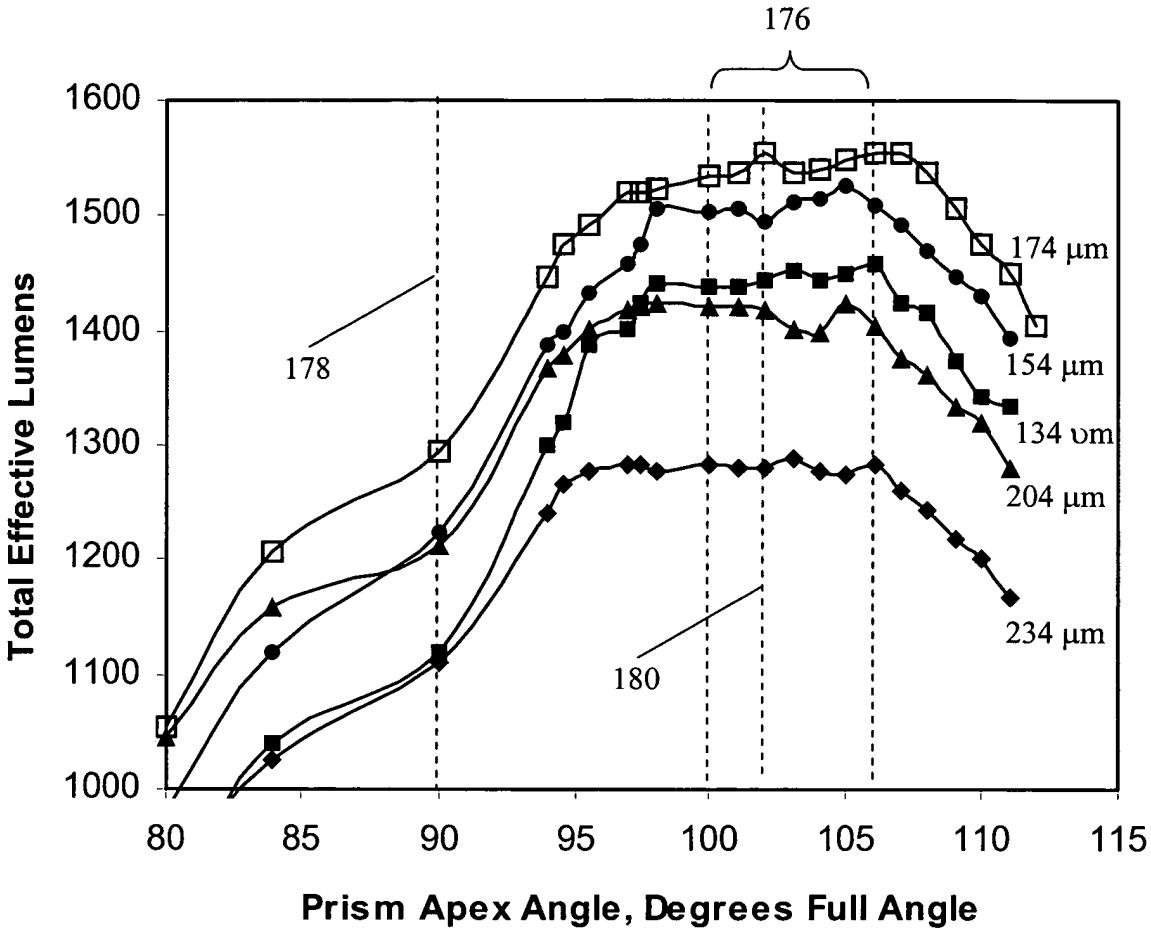

176
1600
1500
1400
1300
1200
1100
1000
Total Effective Lumens
178
174 µm
154 µm
134 υm
204 µm
234 µm
180
80
85
90
95
100
105
110
115
Prism Apex Angle, Degrees Full Angle

FIG. 9

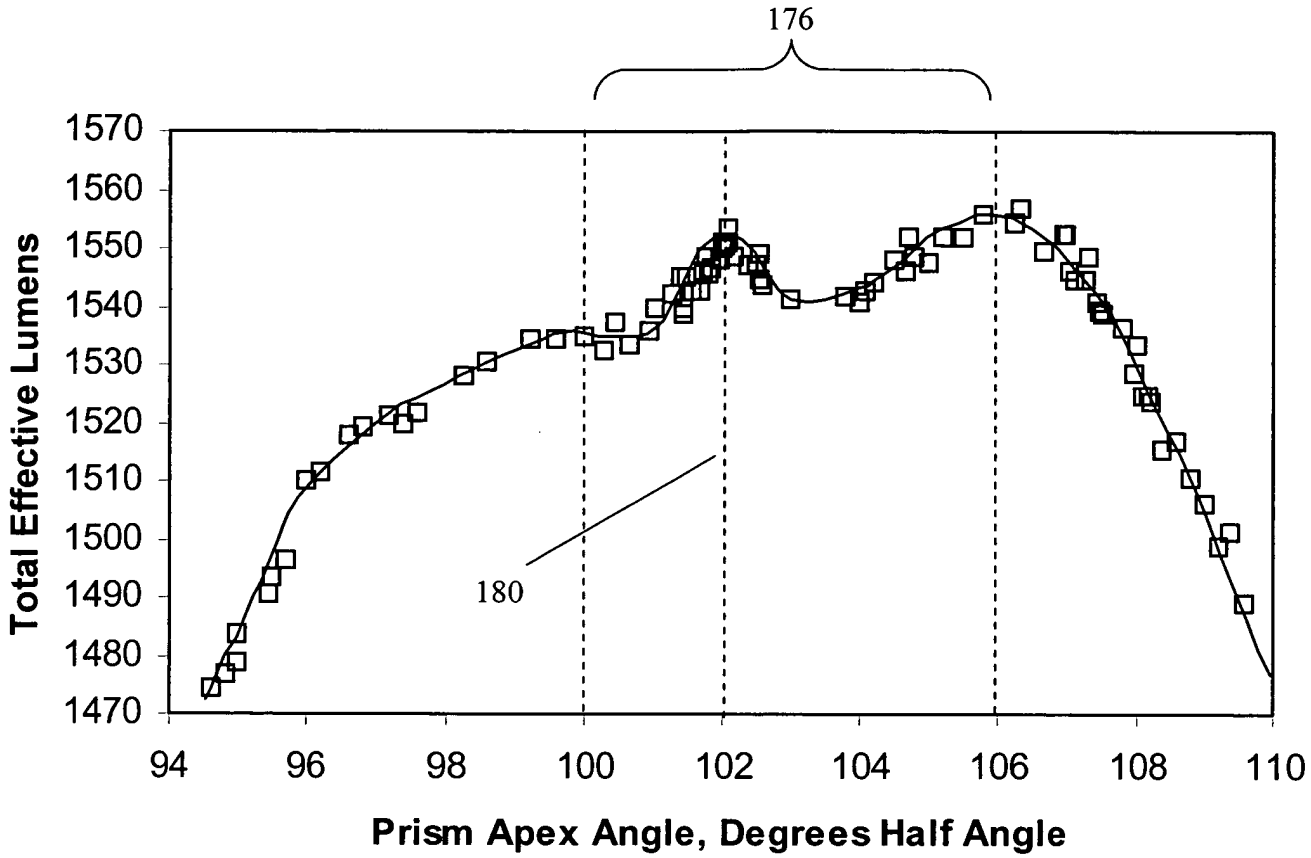

176
1570
1560
1550
1540
1530
1520
1510
1500
1490
1480
1470
Total Effective Lumens
180
94
96
98
100
102
104
106
108
110
Prism Apex Angle, Degrees Half Angle

FIG. 10

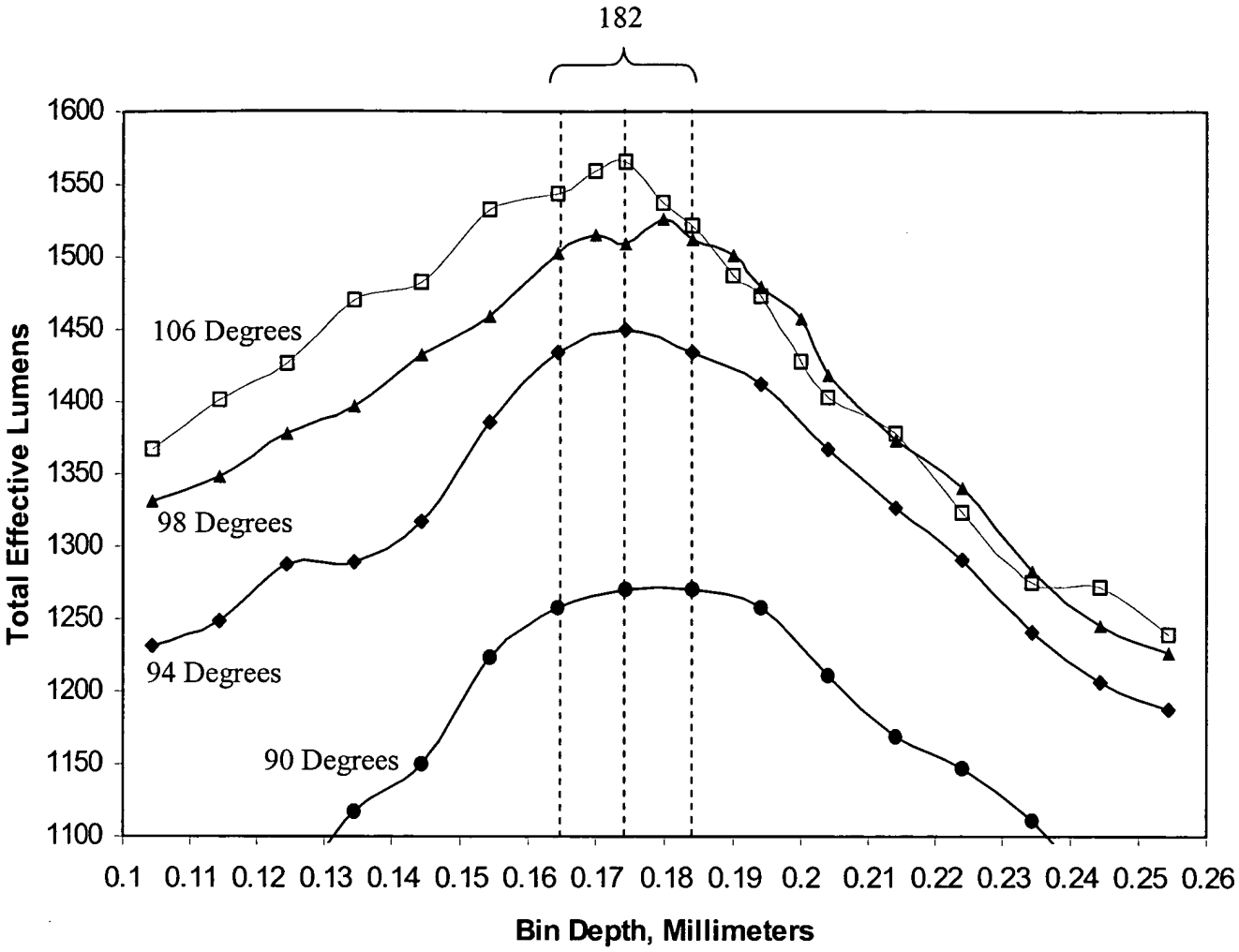

182
1600
1550
1500
1450
1400
1350
1300
1250
1200
1150
1100
Total Effective Lumens
106 Degrees
98 Degrees
94 Degrees
90 Degrees
0.1 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19 0.2 0.21 0.22 0.23 0.24 0.25 0.26
Bin Depth, Millimeters

FIG. 11

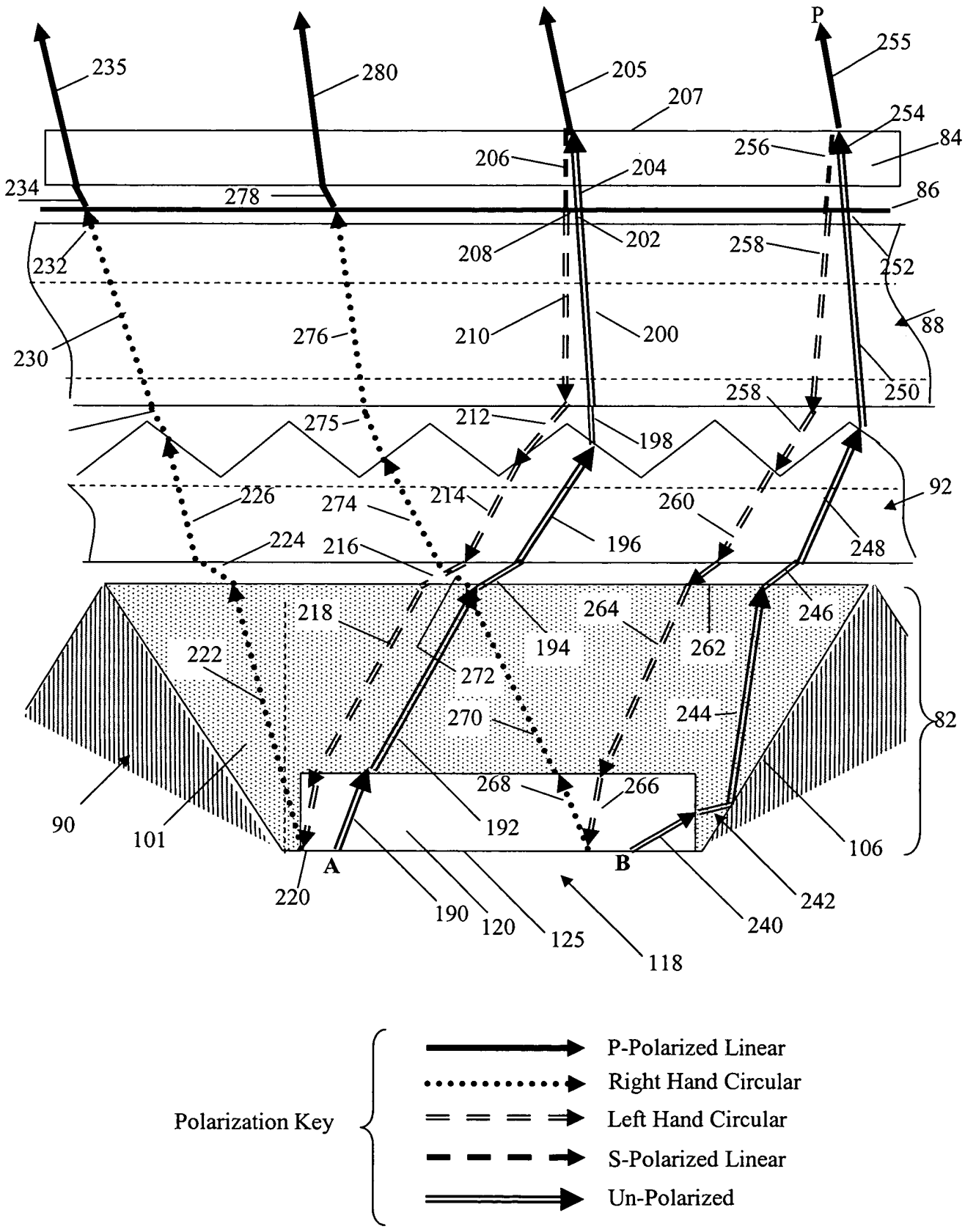
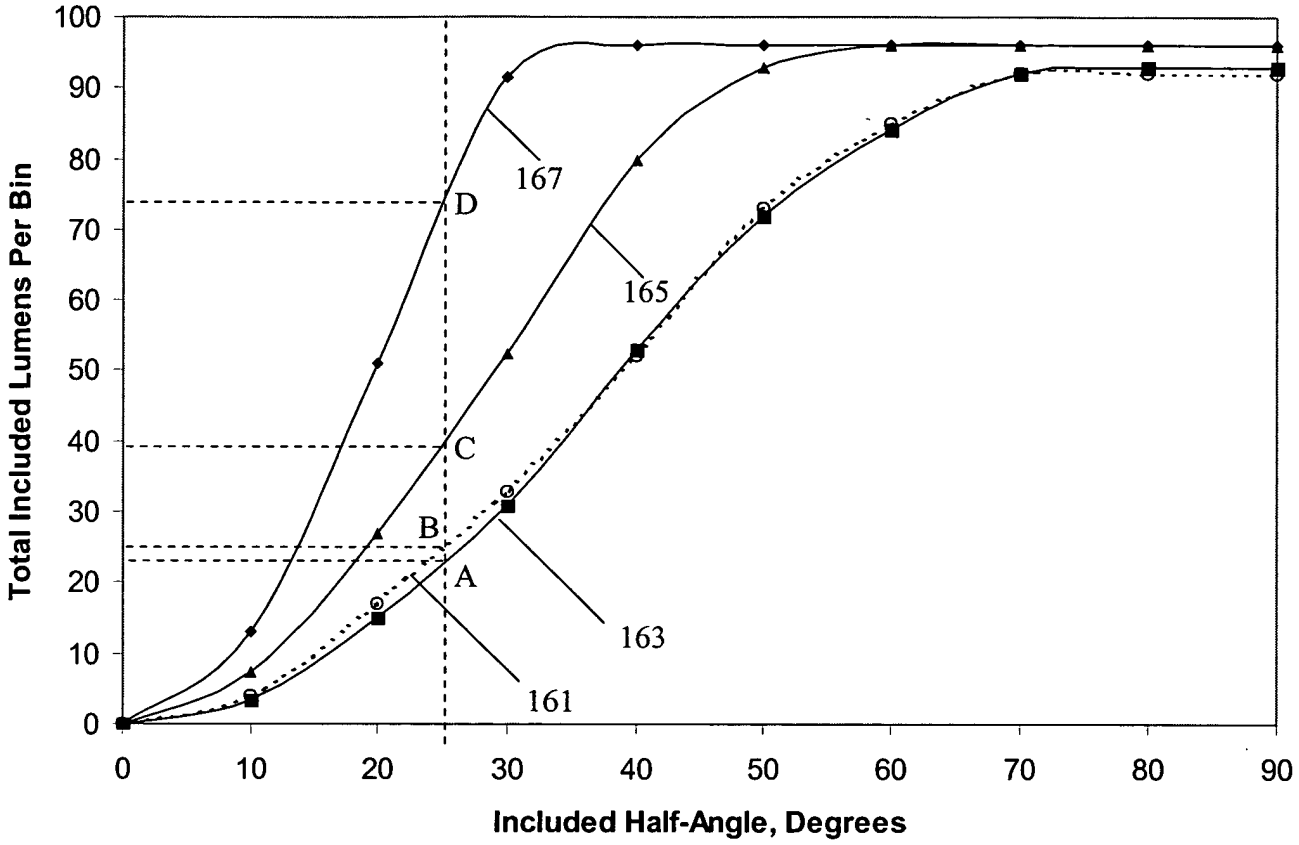

P
235
280
205
207
255
254
84
256
206
204
234
278
86
232
208
202
258
252
230
276
210
200
88
250
275
212
198
226
274
214
260
92
224
216
196
248
218
264
246
222
194
262
272
270
244
82
268
266
90
101
192
106
A
B
220
190
120
125
118
240
242
Polarization Key
P-Polarized Linear
Right Hand Circular
Left Hand Circular
S-Polarized Linear
Un-Polarized

FIG. 12



	A	B	C	D
$+/-\theta_{OUT}$, MEDIA	43.4	N.A.	30	20
$+/-\theta_{OUT}$, AIR	90	90	48	30
X_{BIN}	1.6	1.6	2.2	3.2
LUMENS/BIN, $+/-25^{O}$	23	25	40	72.5
N BINS	42	42	22	10.5
TOTAL LUMENS	966	1050	880	761

FIG. 13.

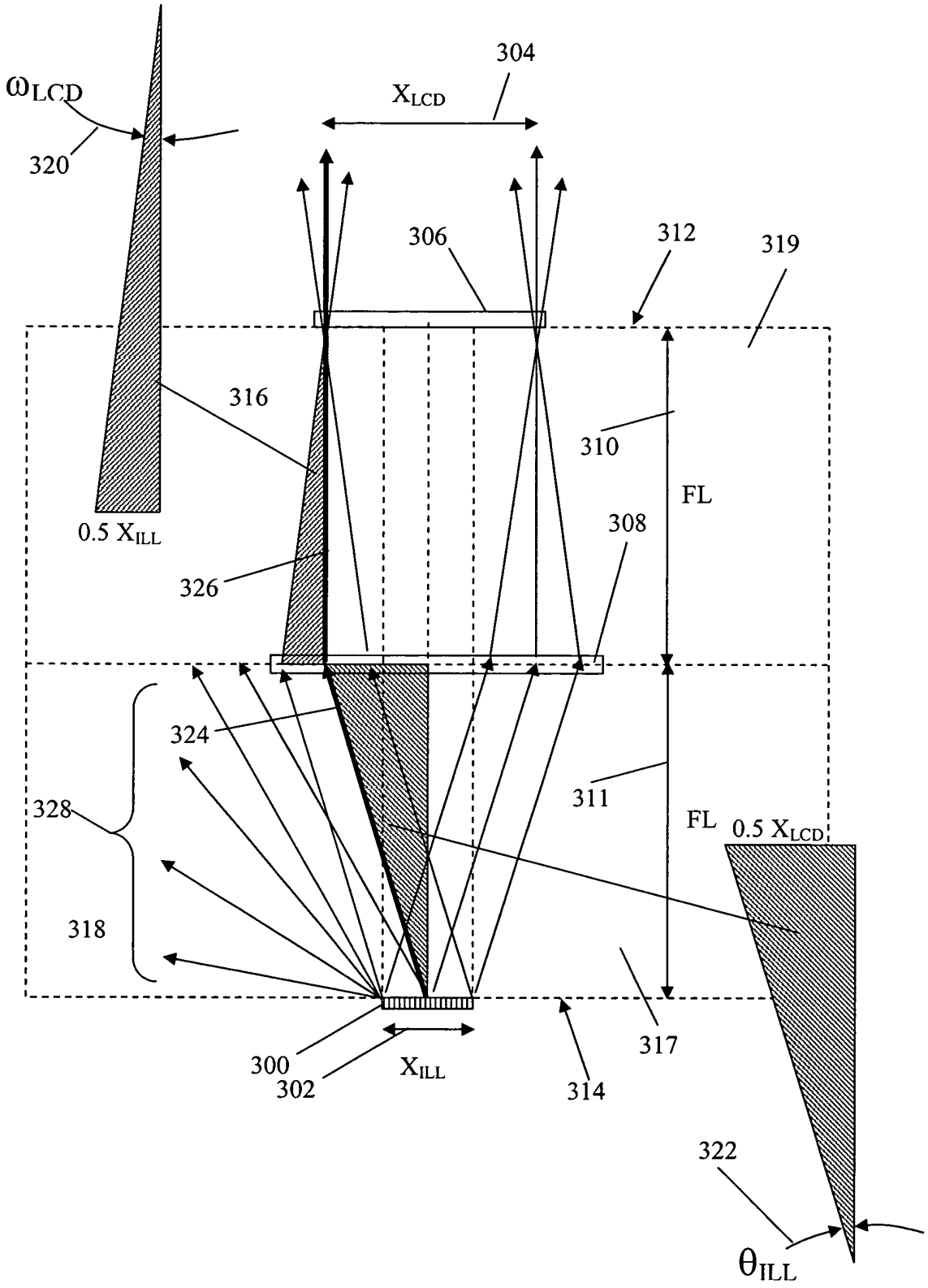

ω_{LCD}
320
304
X_{LCD}
306
312
319
316
310
FL
0.5 X_{ILL}
308
326
324
328
318
311
FL
0.5 X_{LCD}
317
300
302
X_{ILL}
314
322
θ_{ILL}

FIG. 14.

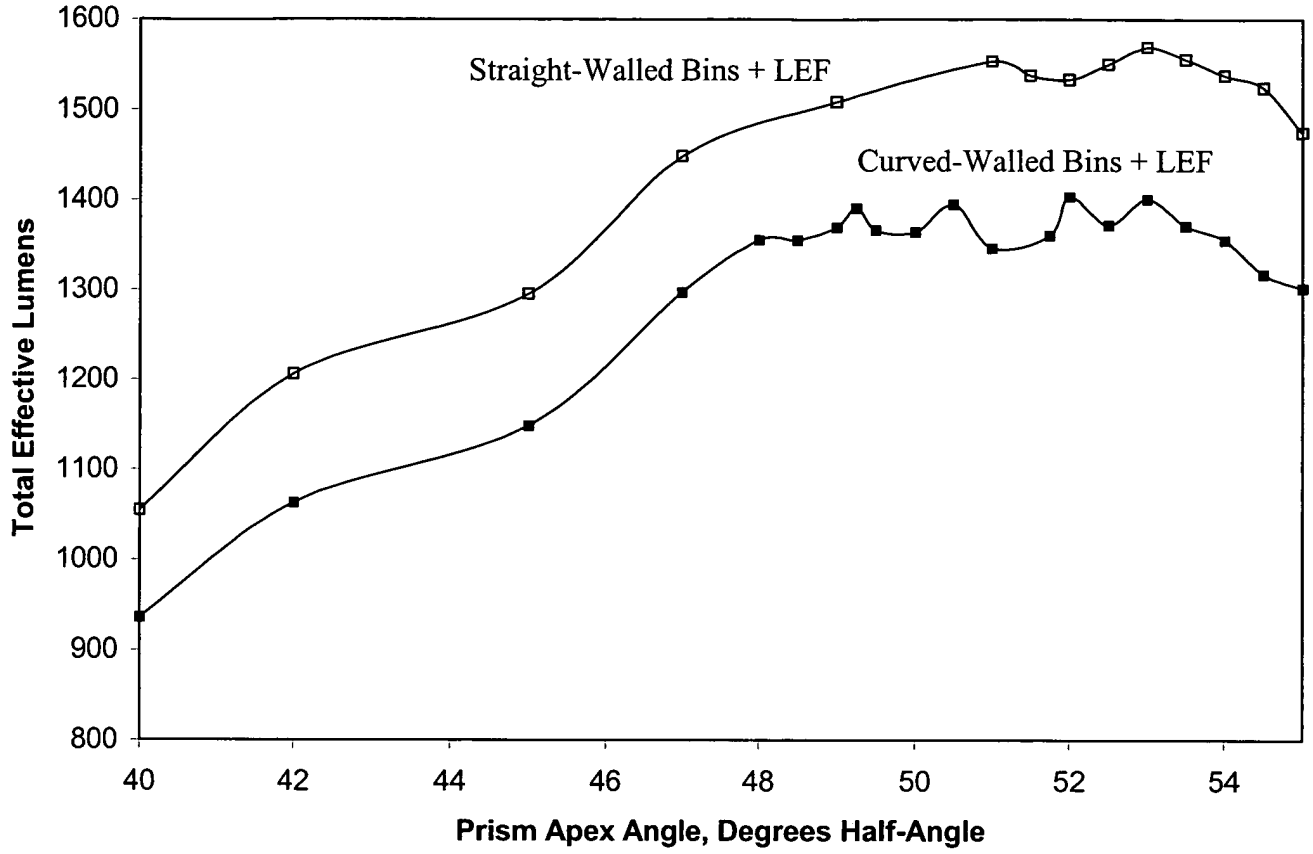

Straight-Walled Bins + LEF
Curved-Walled Bins + LEF
Total Effective Lumens
1600
1500
1400
1300
1200
1100
1000
900
800
40
42
44
46
48
50
52
54
Prism Apex Angle, Degrees Half-Angle

FIG. 15A.

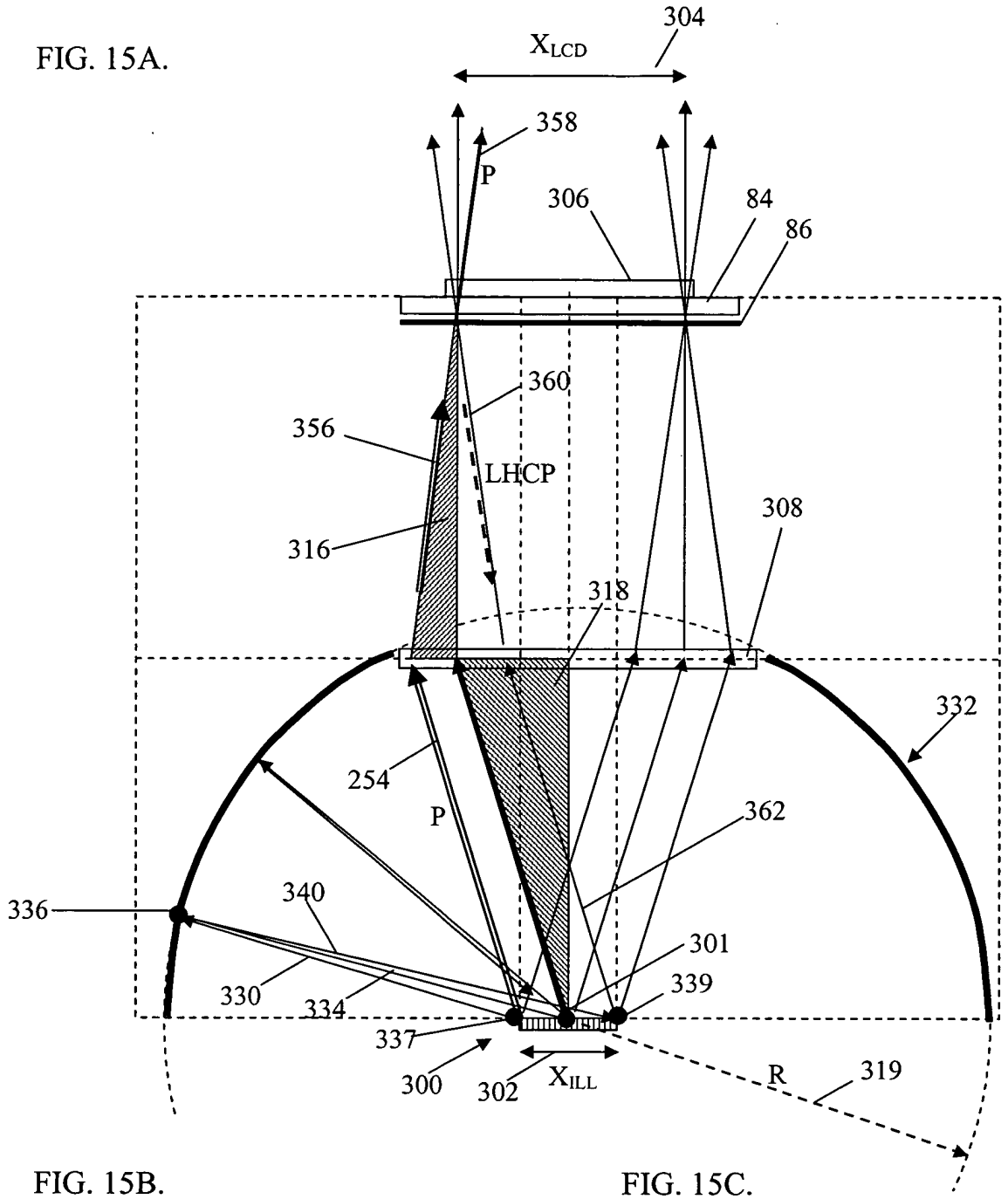


FIG. 15B.

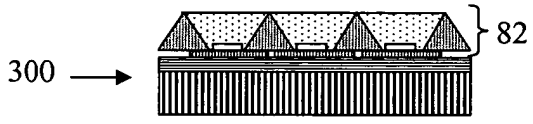


FIG. 15C.

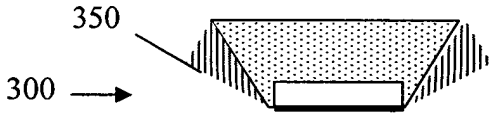


FIG. 15D.

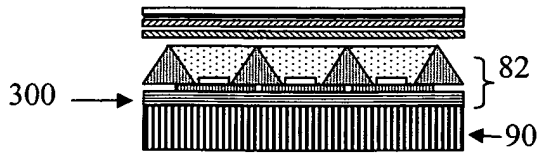


FIG. 15E.

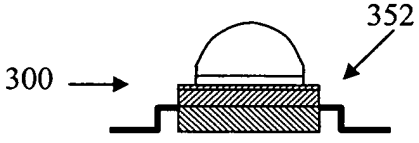


FIG. 16A.

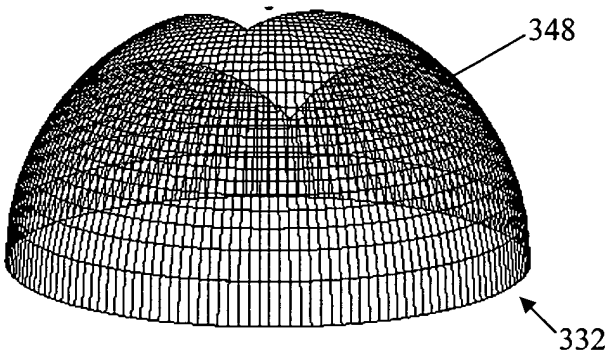


FIG. 16B

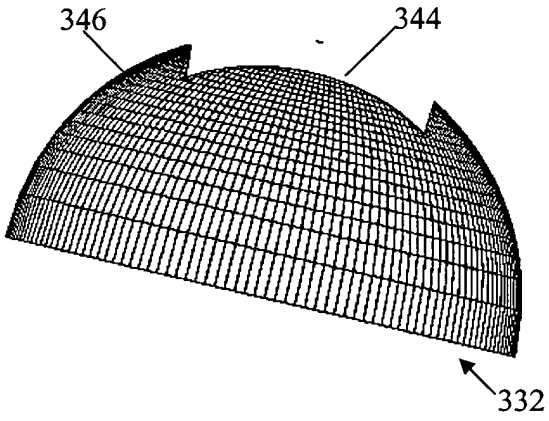


FIG. 16C

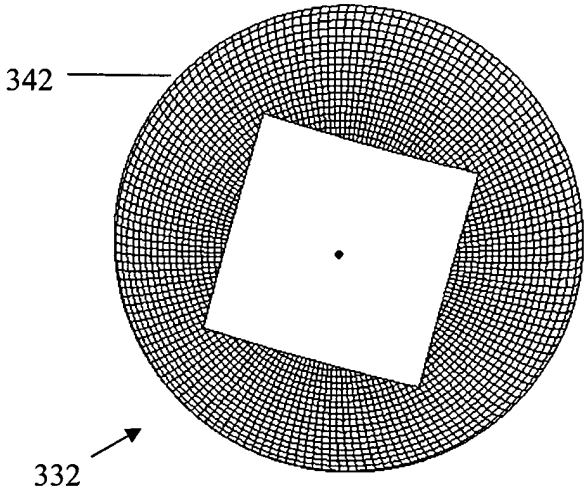


FIG. 16D.

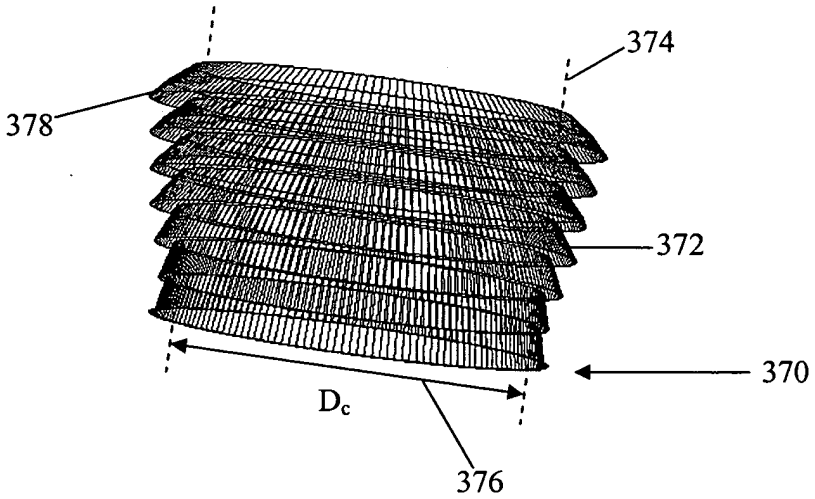


FIG. 17

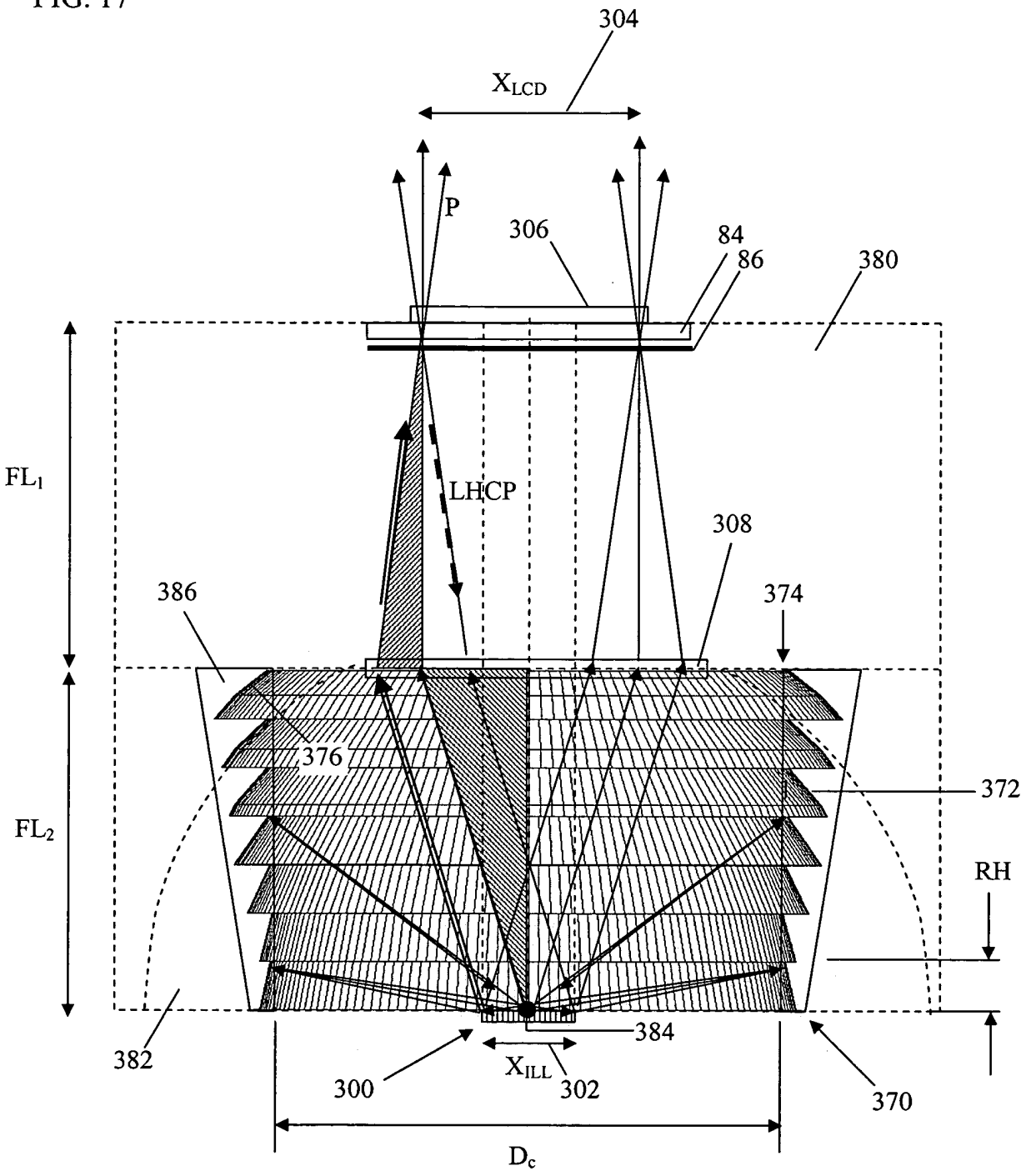

304
X_{LCD}
P
306
84
86
380
FL_1
LHCP
308
386
374
376
372
FL_2
RH
384
382
X_{ILL}
300
302
370
D_c

FIG. 18

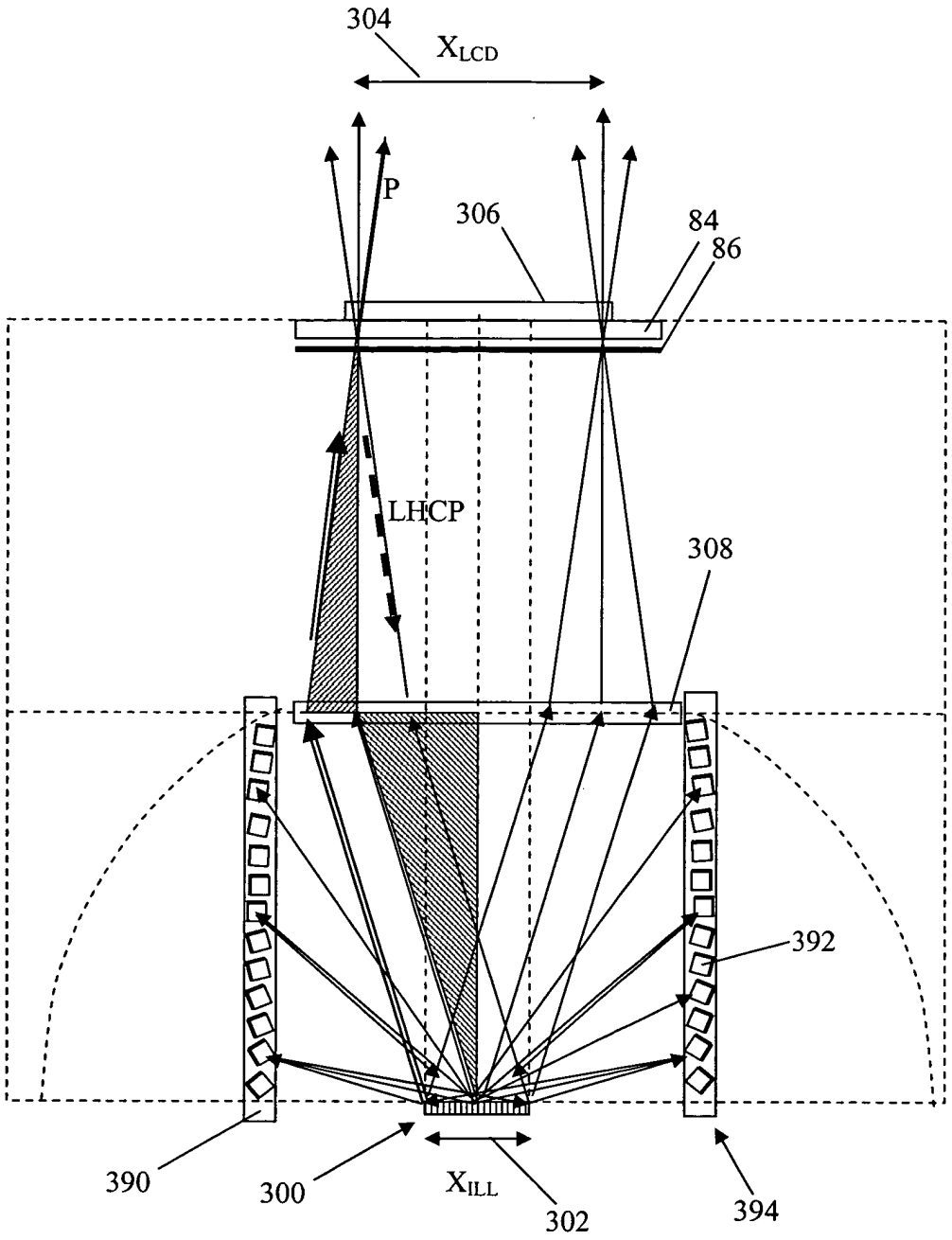


FIG. 19A.

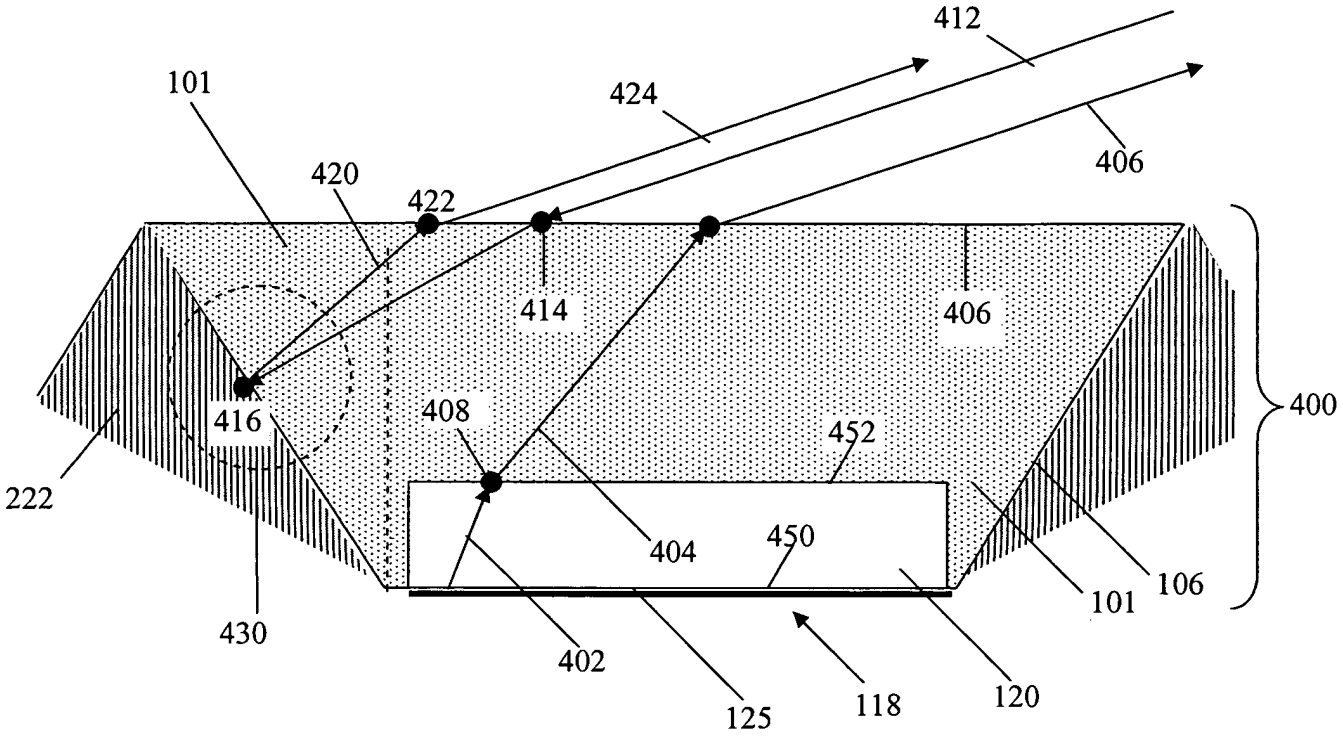


FIG. 19B.

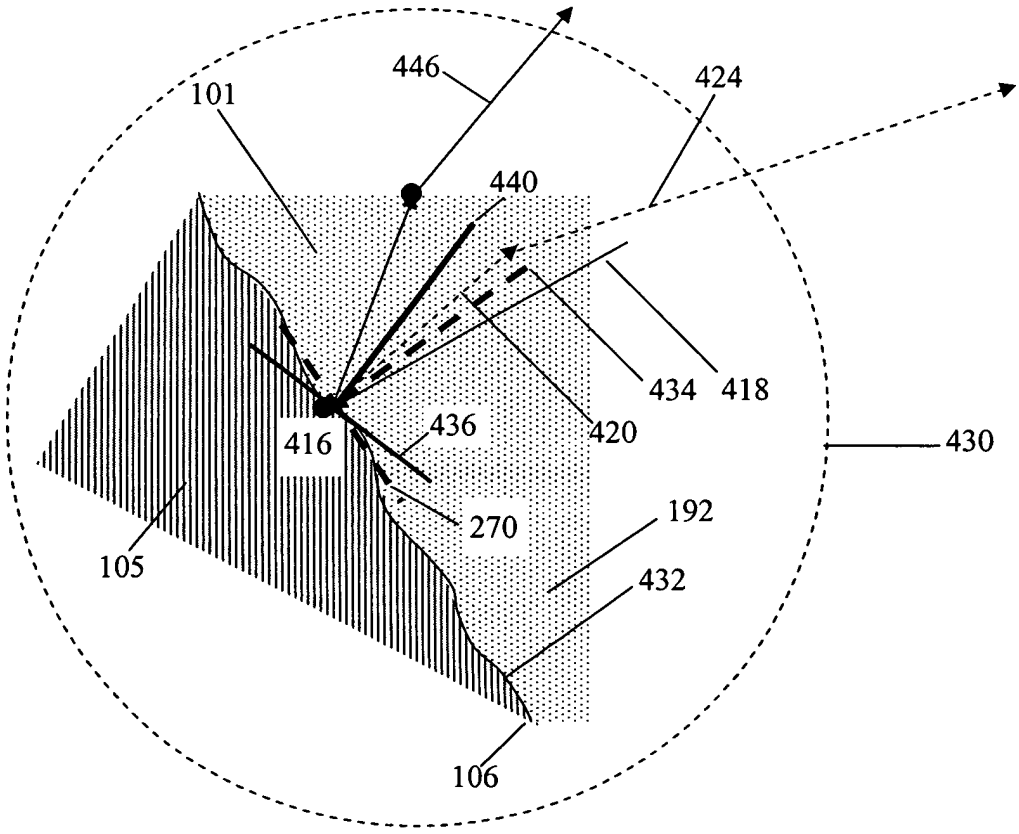


FIG. 20

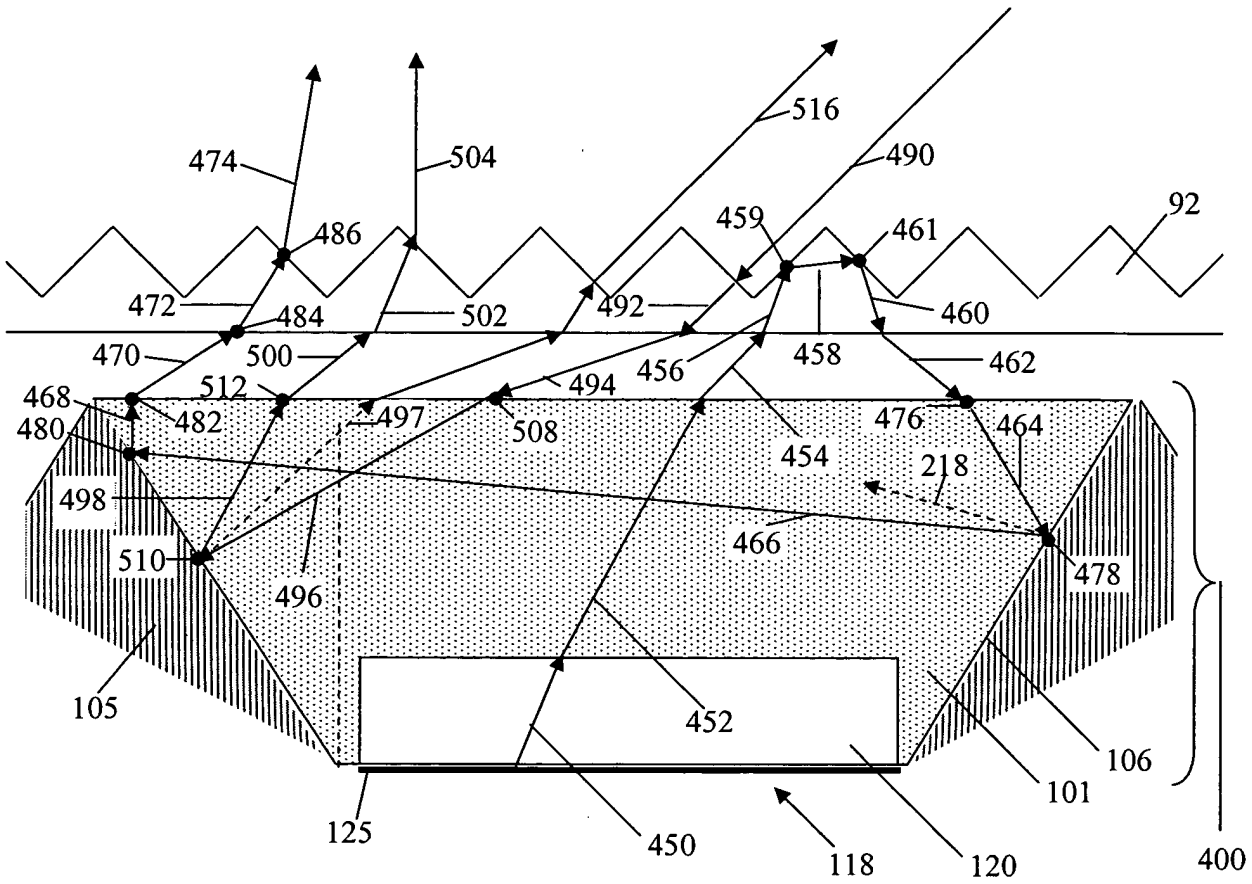

474
504
516
490
92
459
461
486
472
484
502
492
460
470
500
458
462
456
468
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494
480
482
497
508
476
464
454
218
498
466
510
496
478
105
452
106
101
125
450
118
120
400

FIG. 21A.

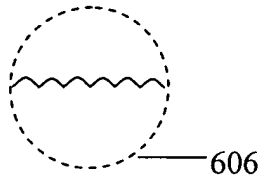


FIG. 21B.

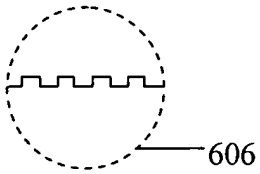


FIG. 21C.

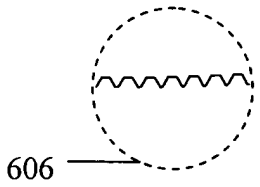


FIG. 21D.

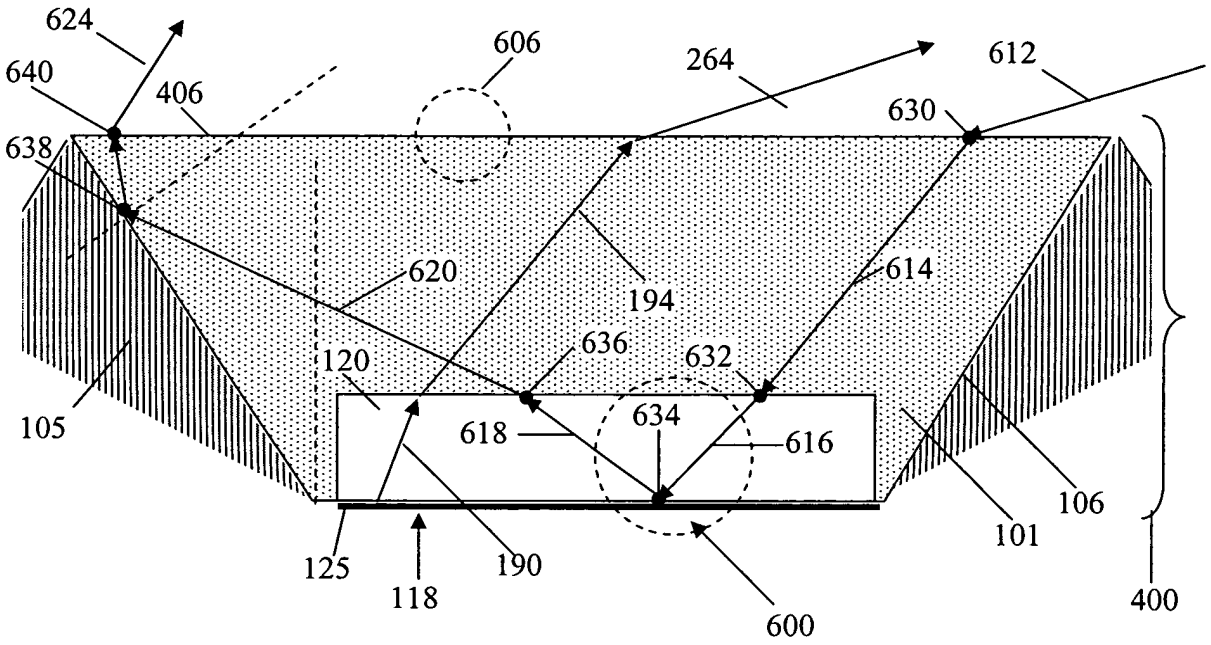


FIG. 21E.

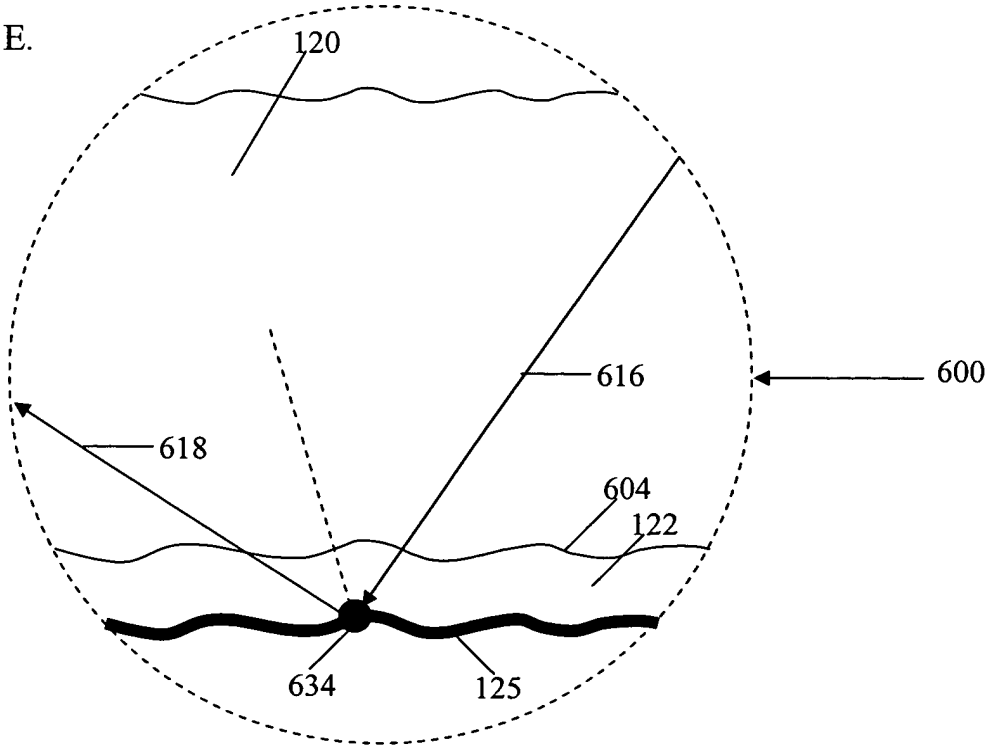


FIG. 22A.

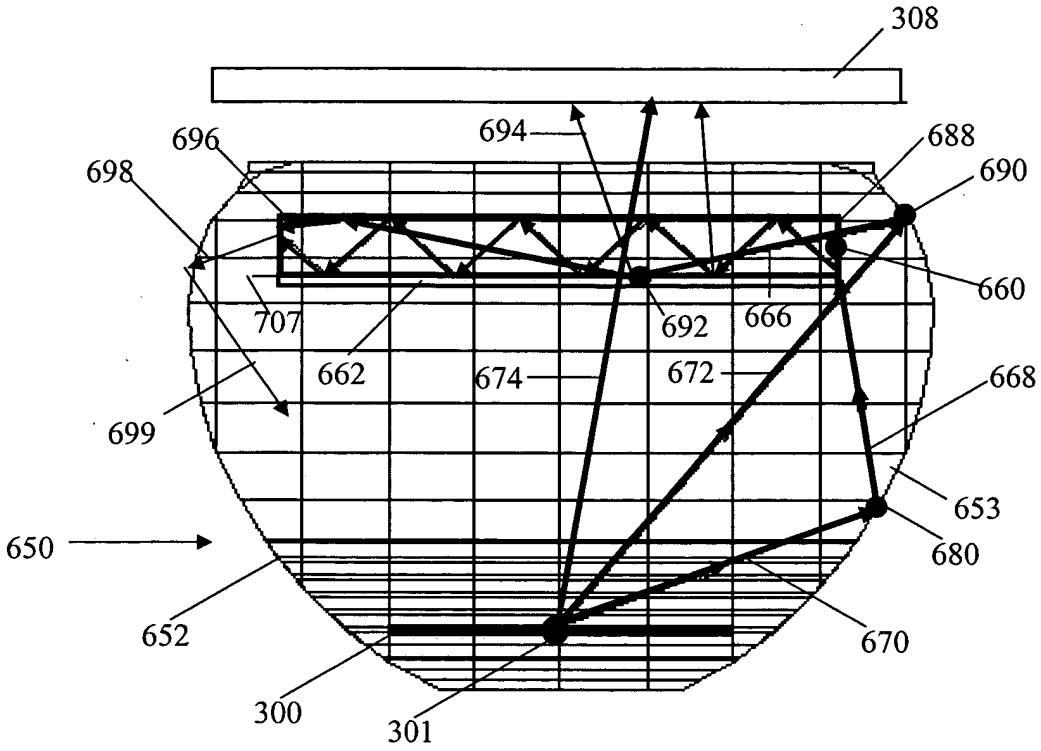


FIG. 22B.

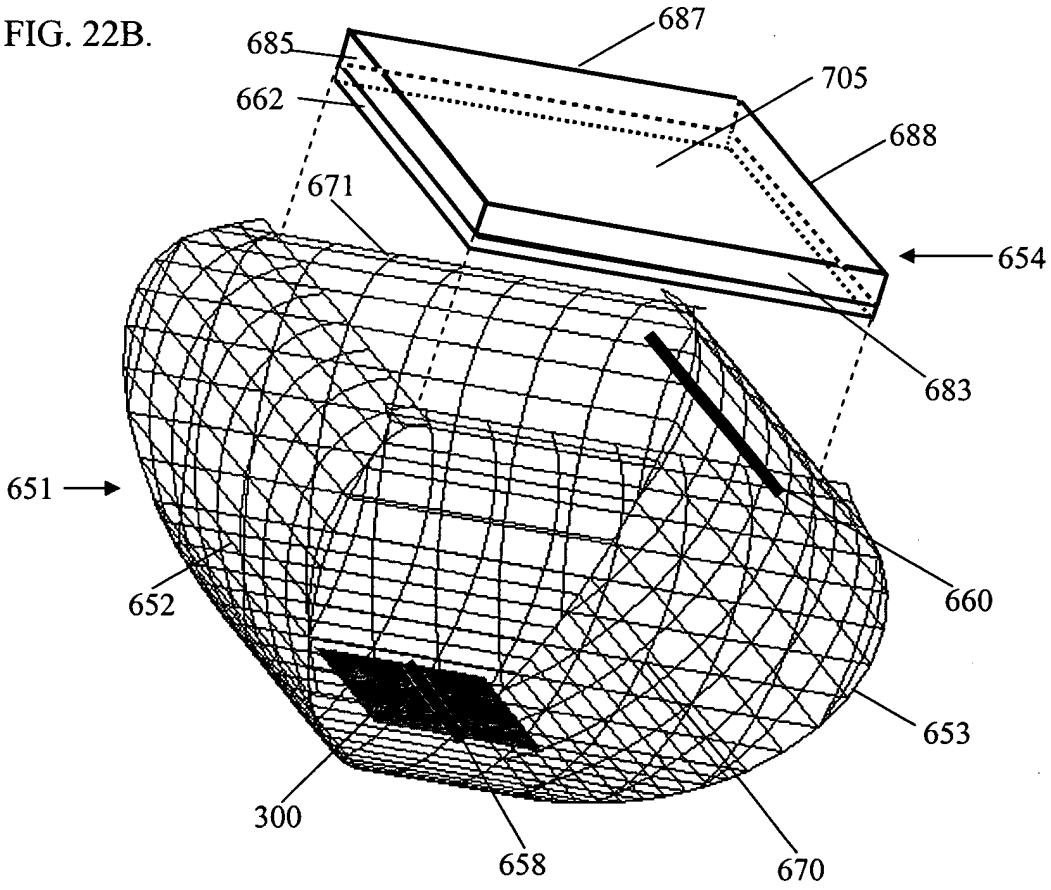


FIG. 23A.

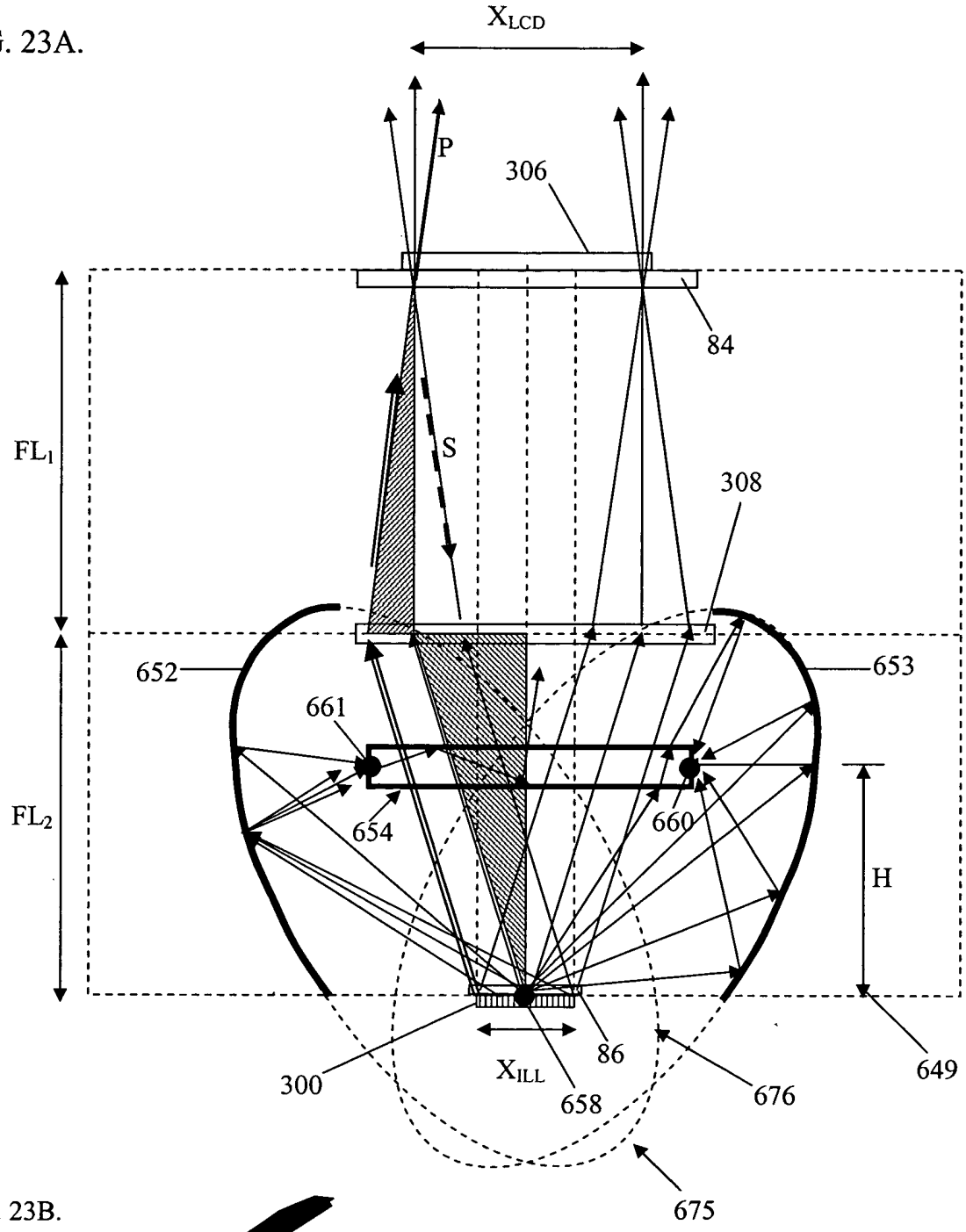


FIG. 23B.

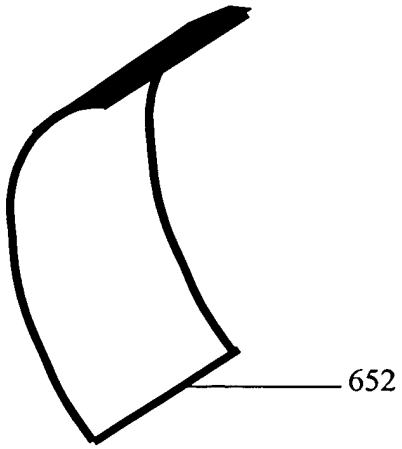


FIG. 24A.

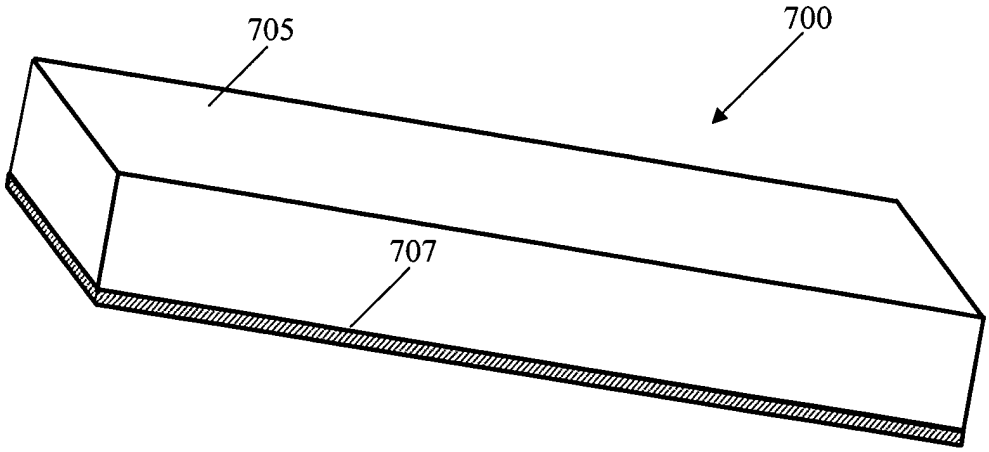


FIG. 24B.

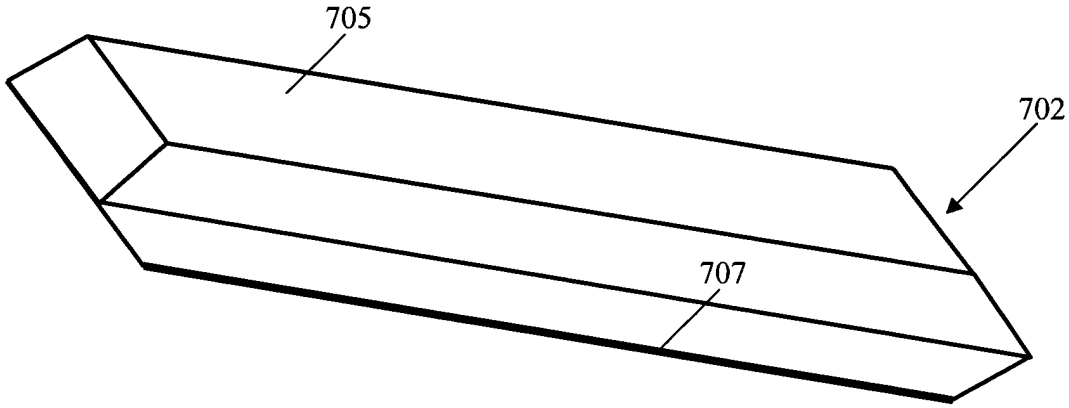


FIG. 24C.

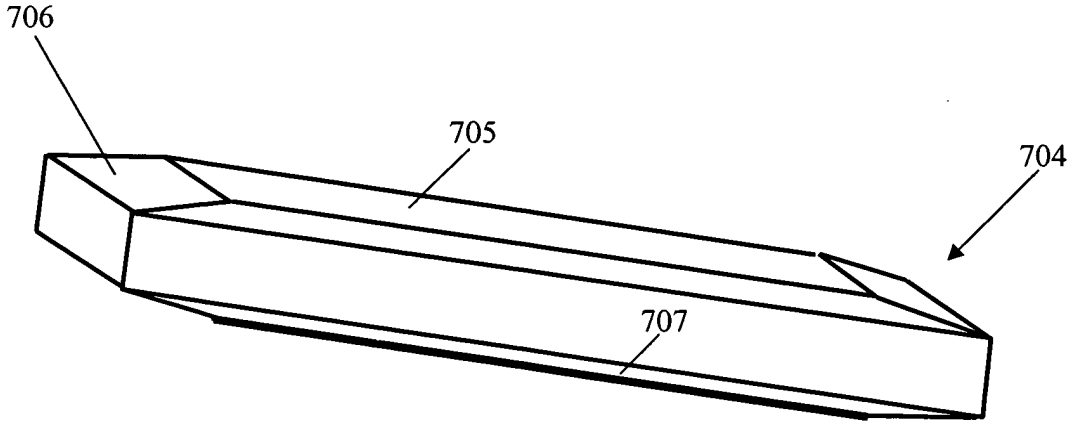


FIG. 25A.

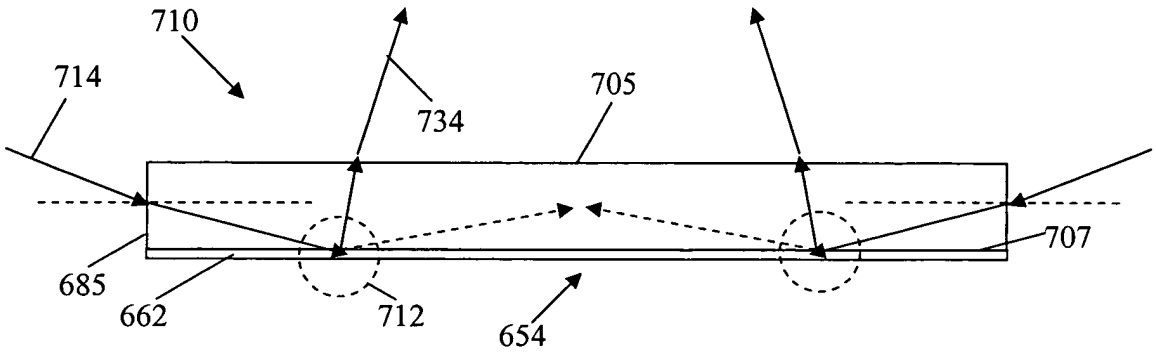


FIG. 25B.

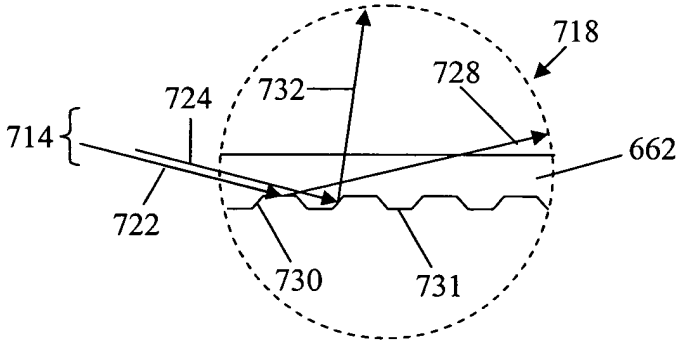


FIG. 25C.

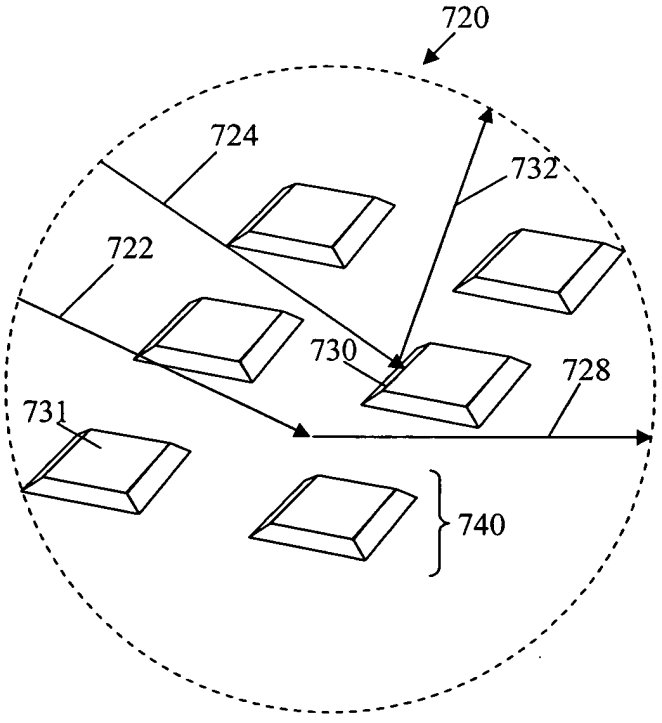


FIG. 26

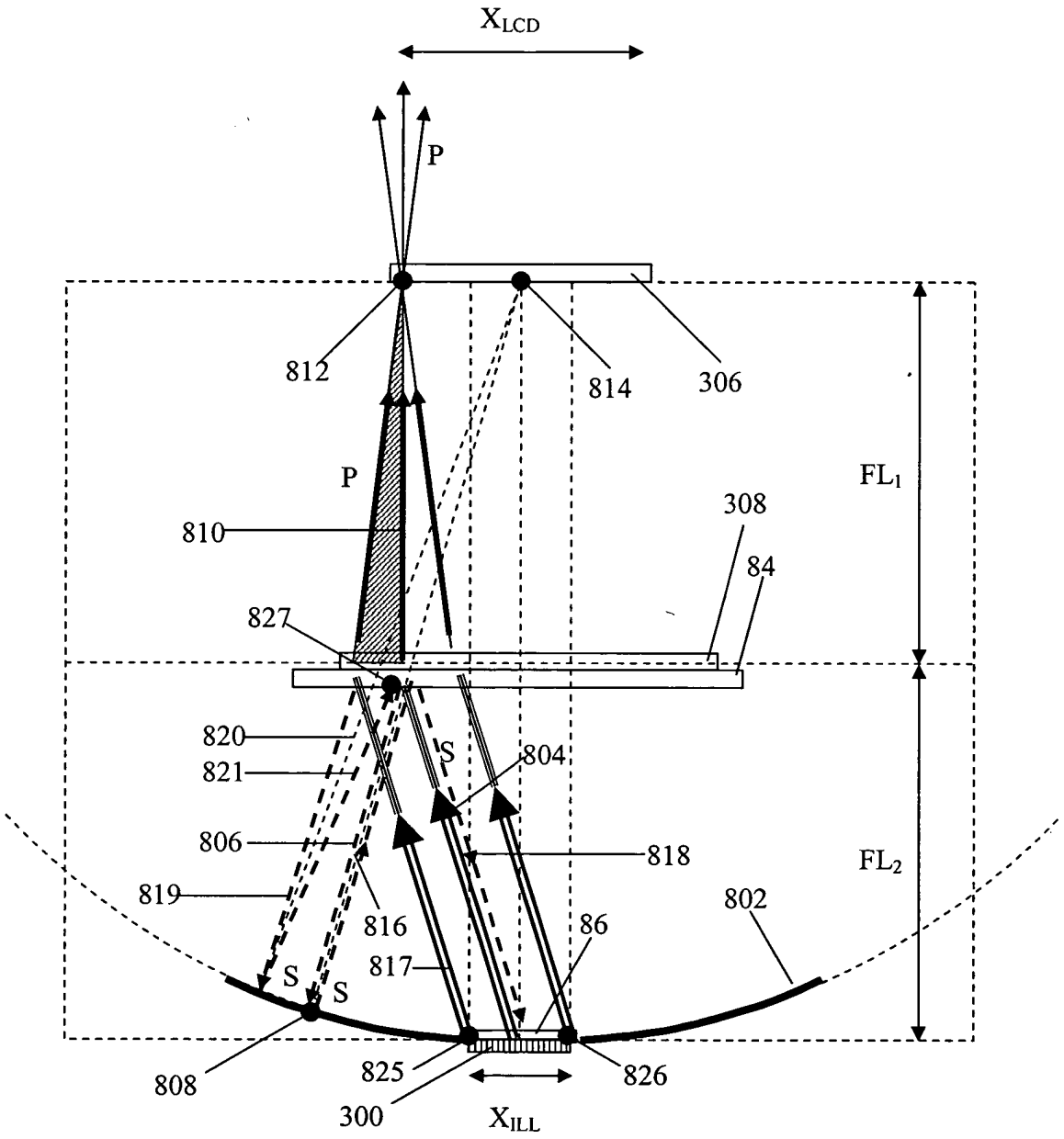

X_{LCD}
P
812
814
306
P
FL_1
308
810
84
827
820
821
S
804
806
818
FL_2
819
816
86
802
817
S
S
808
825
826
300
X_{ILL}

FIG. 27

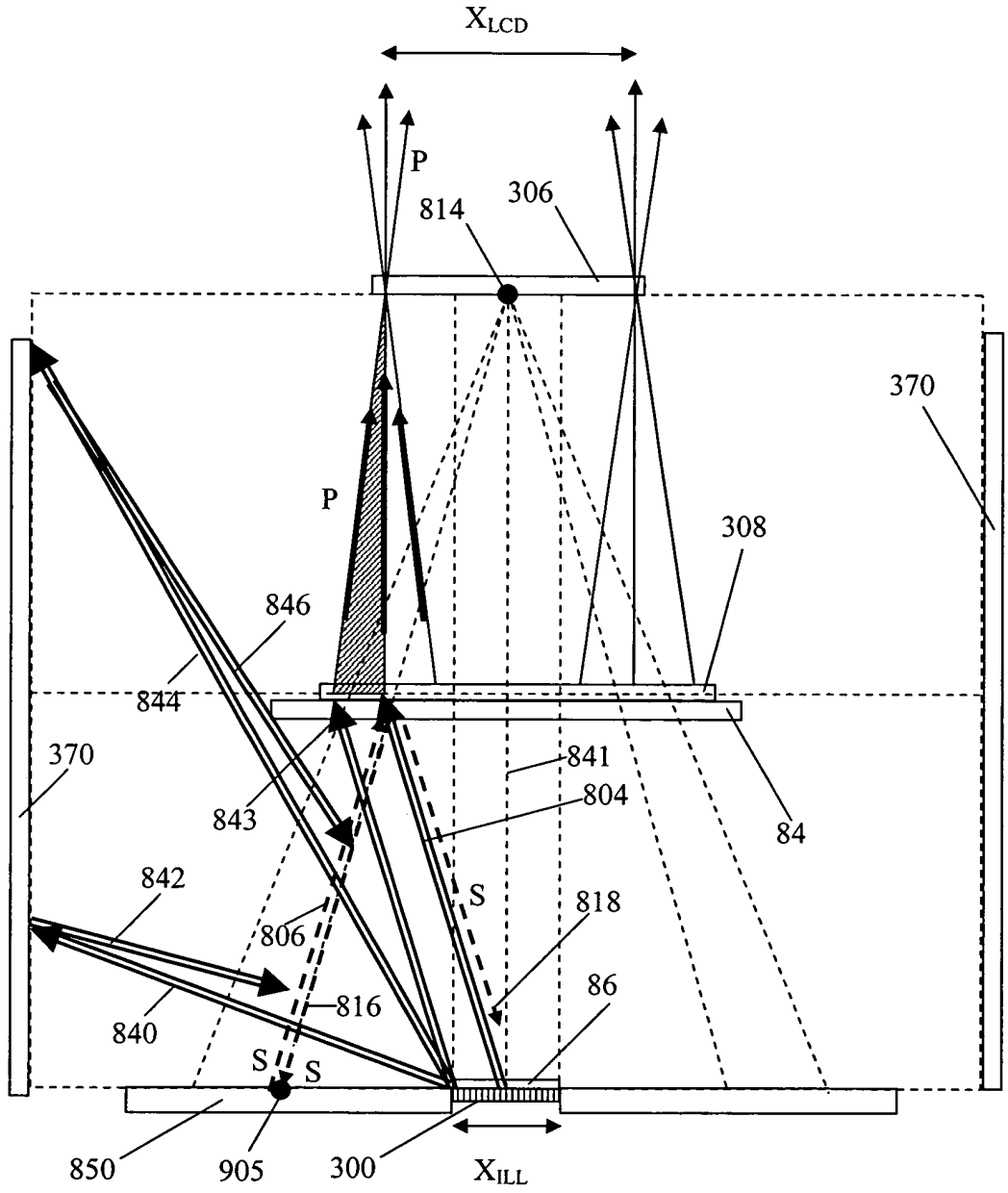

X_{LCD}
P
814
306
370
P
308
846
844
370
841
804
843
84
842
S
818
806
816
86
840
S
S
850
905
300
X_{ILL}

FIG. 28A.

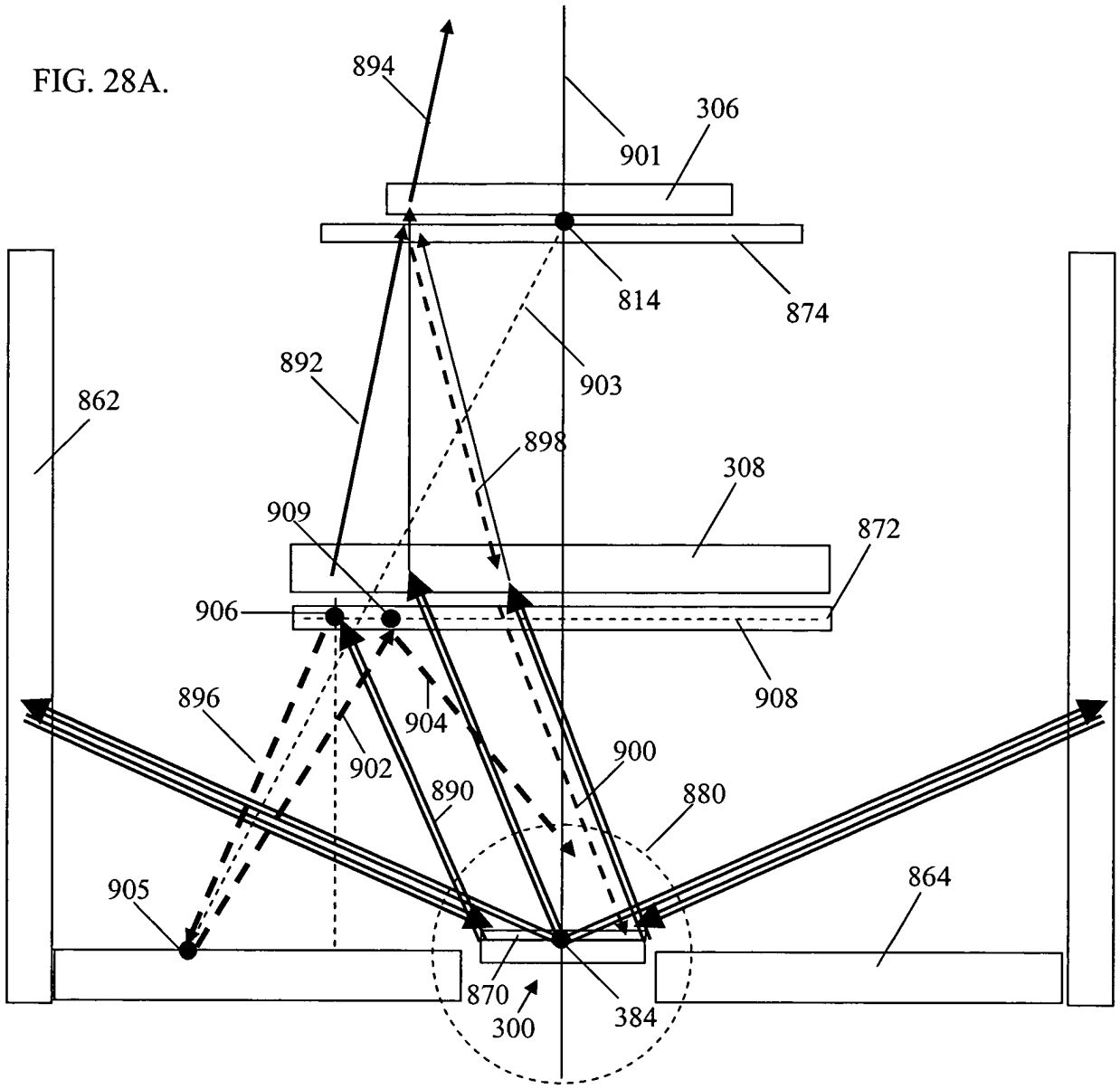


FIG. 28B.

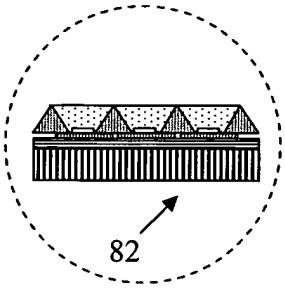


FIG. 28C.

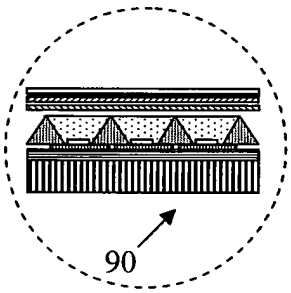


FIG. 28D.

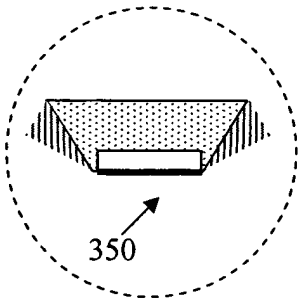


FIG. 28E.

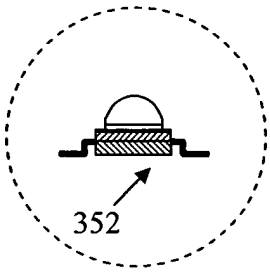
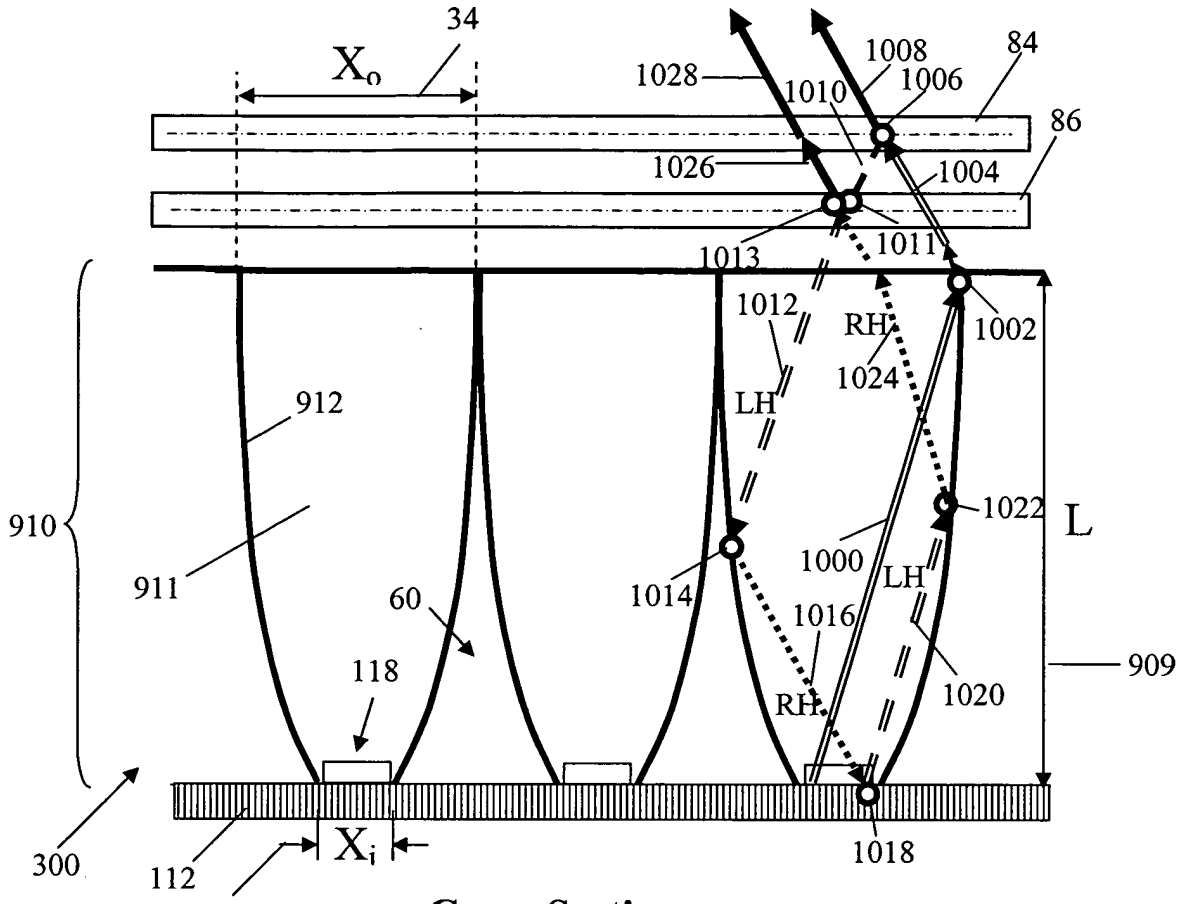
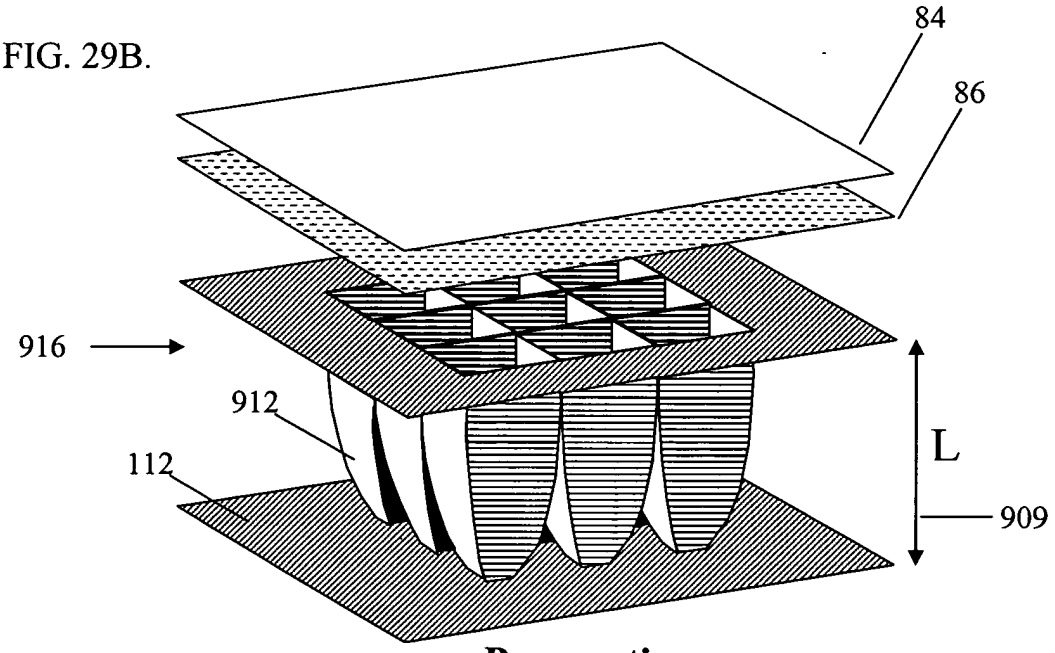


FIG. 29A.



Cross-Section

FIG. 29B.



Perspective

FIG. 30A.

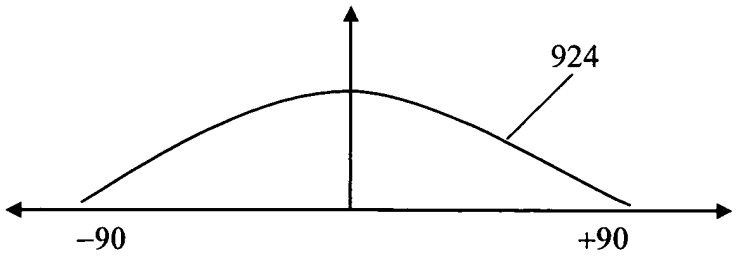


FIG. 30B.

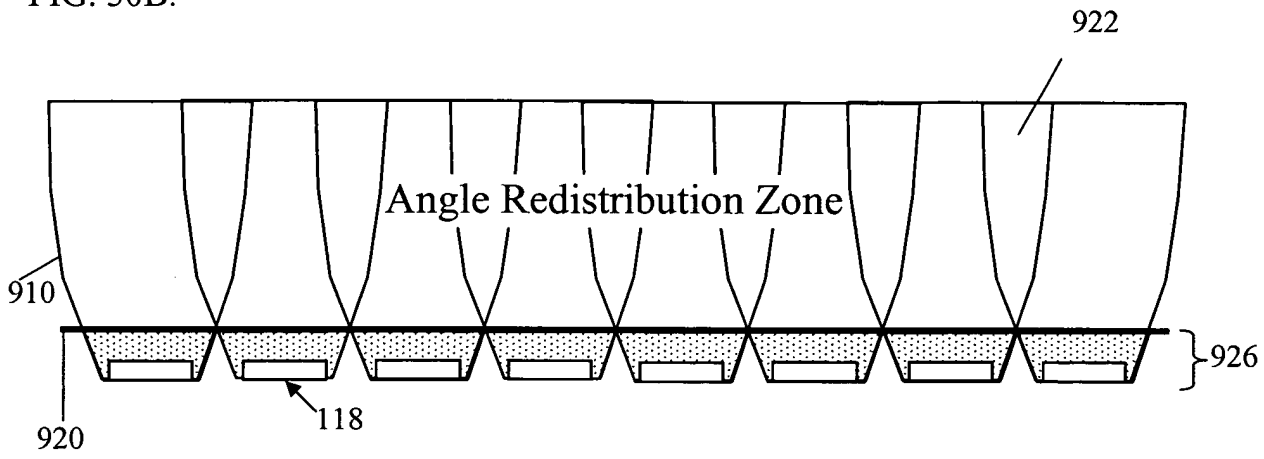


FIG. 31A.

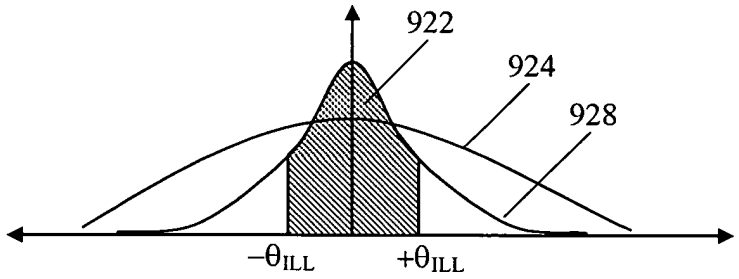


FIG. 31B.

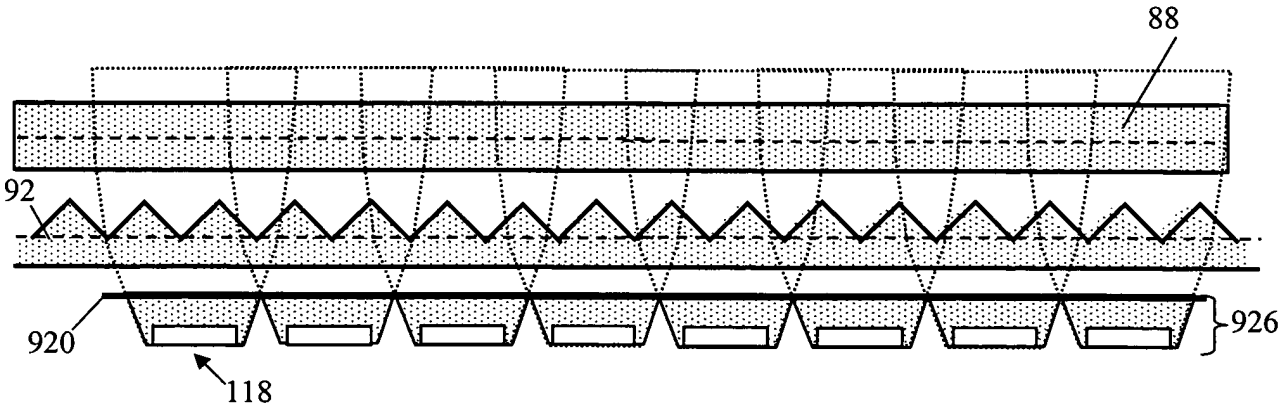


FIG. 32A.

9 Etendue-Preserving Bins; Center On, Neighbors Off

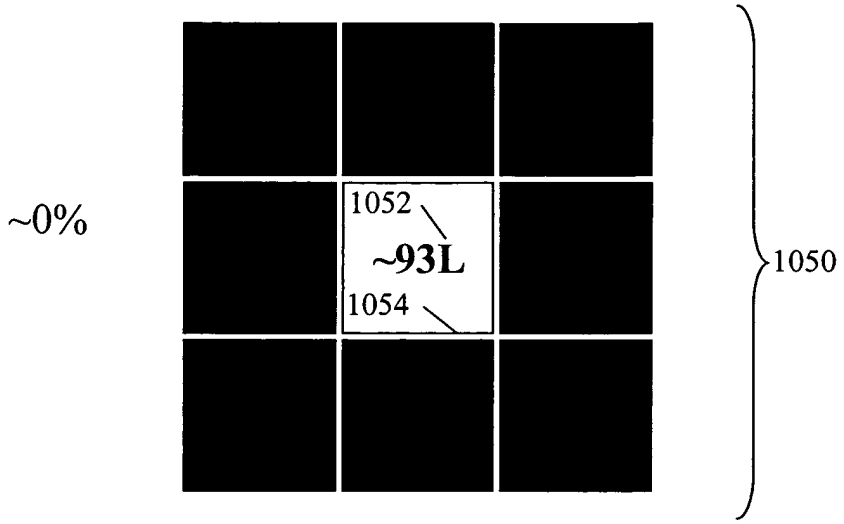


FIG. 32B.

9 Etendue-Preserving Bins; All On

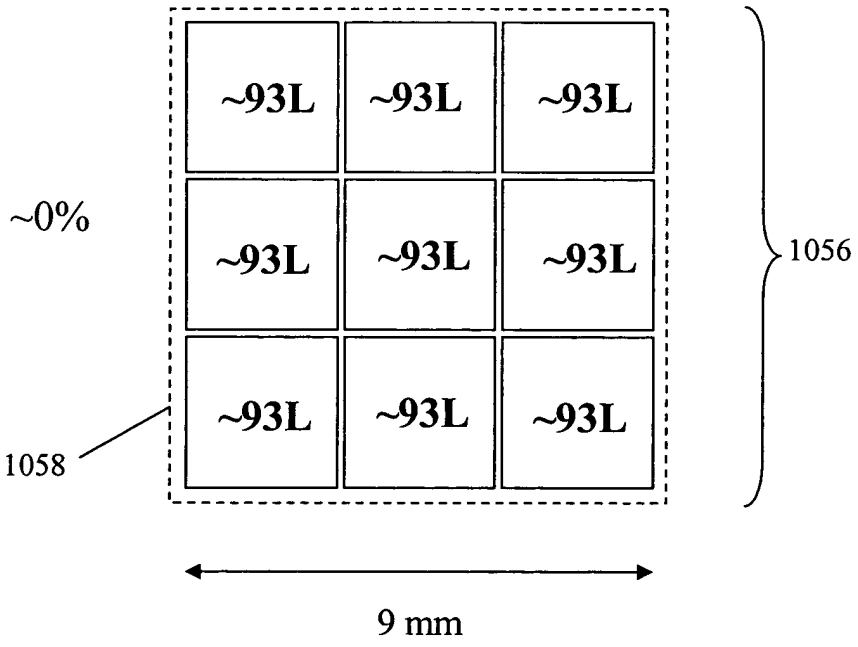


FIG. 33A.

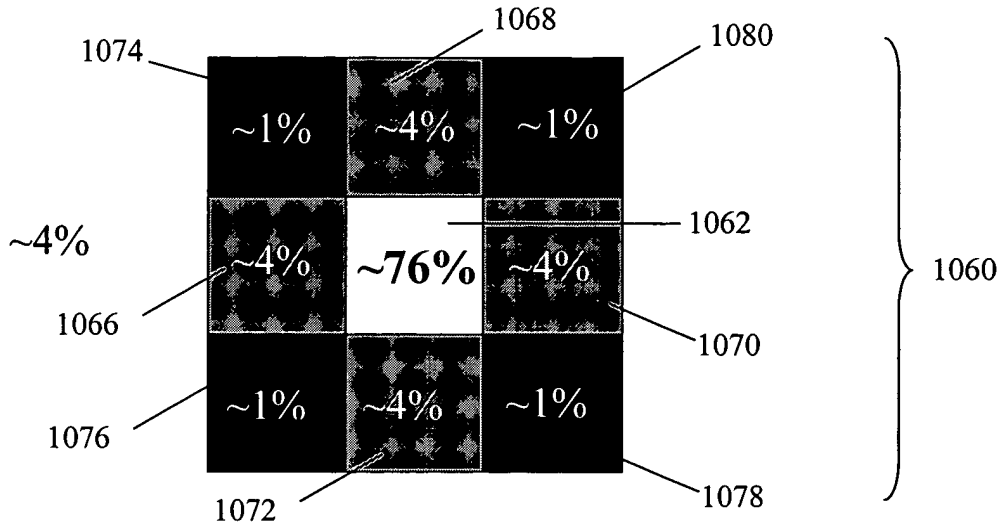


FIG. 33B.

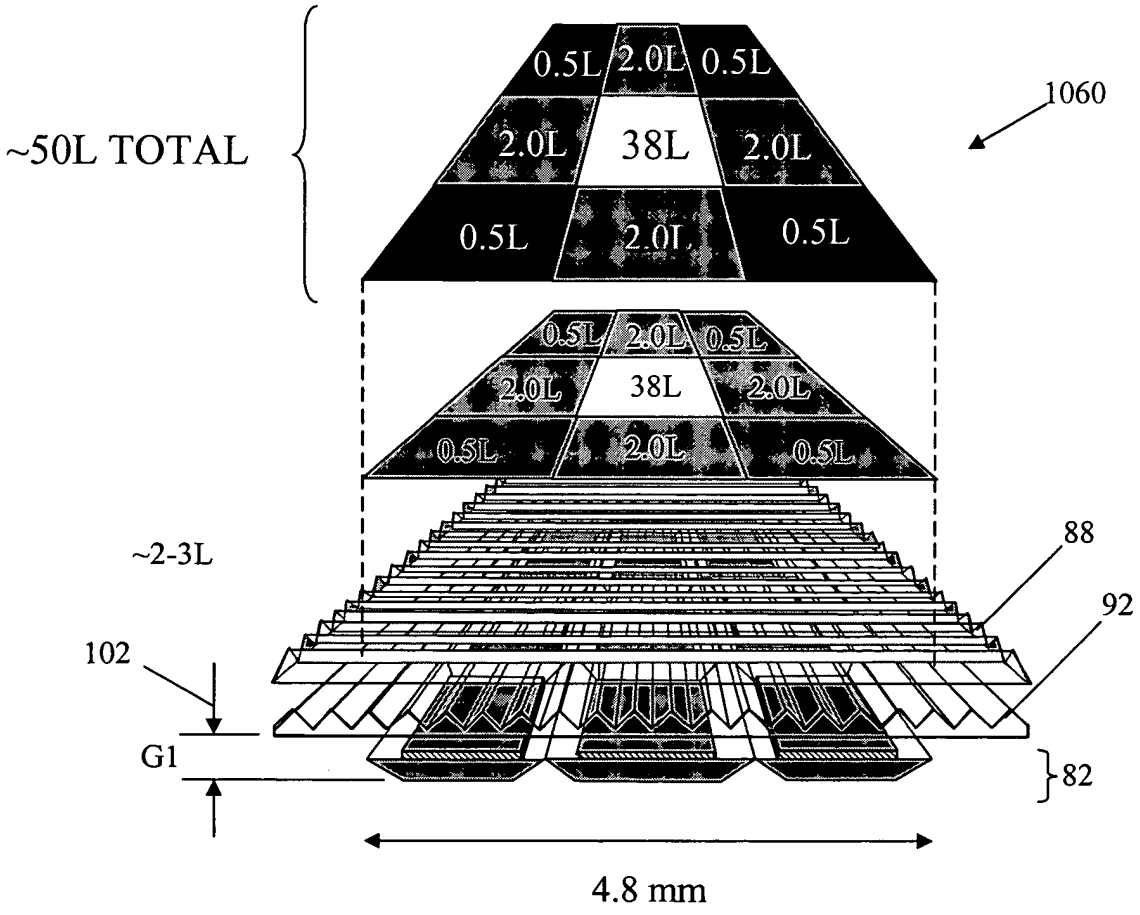


FIG. 34

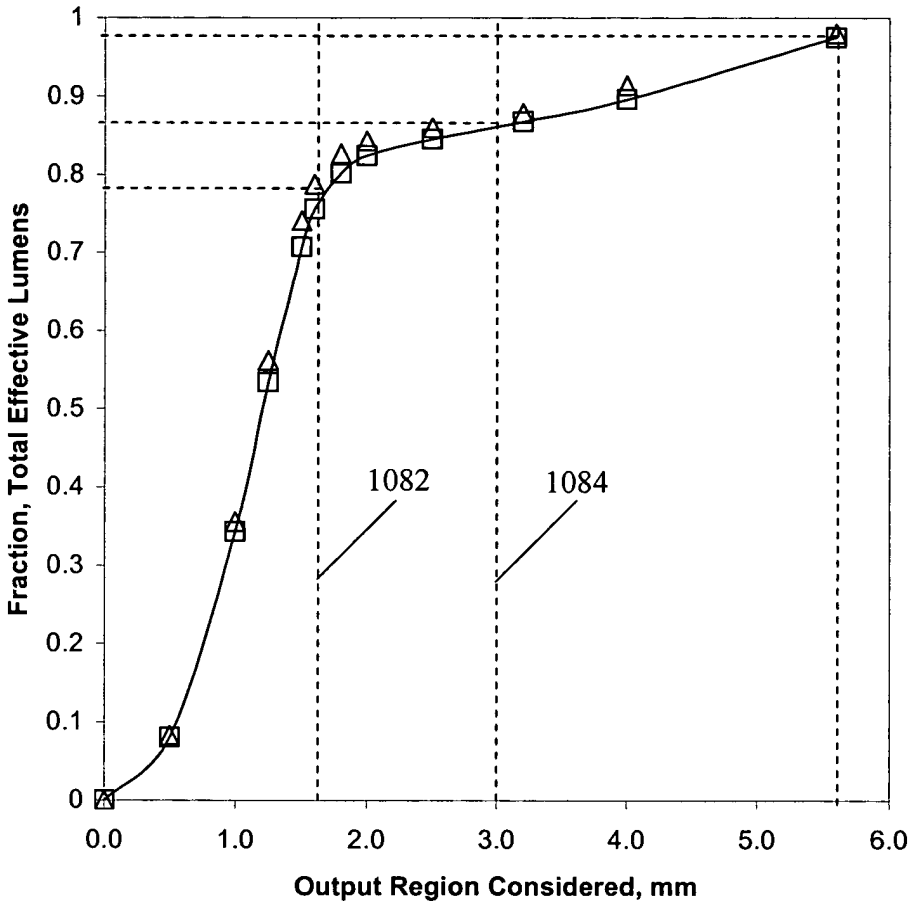

Fraction, Total Effective Lumens
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
Output Region Considered, mm
1082
1084

FIG. 35A.

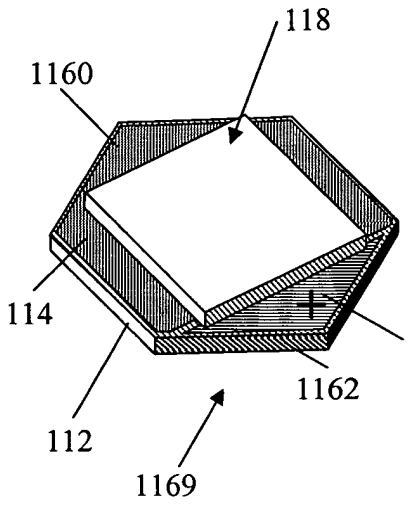


FIG. 35B.

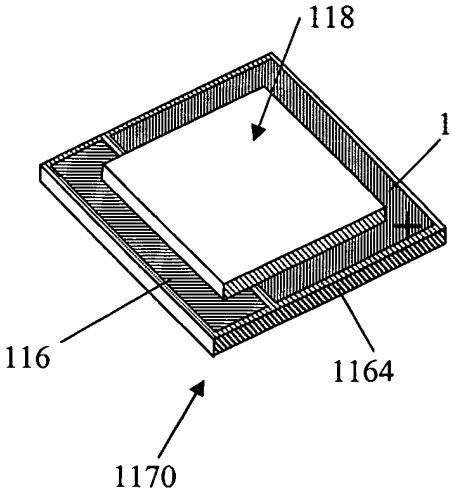


FIG. 35C.

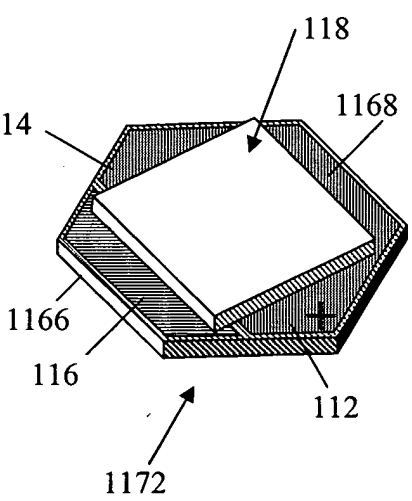


FIG. 35D.

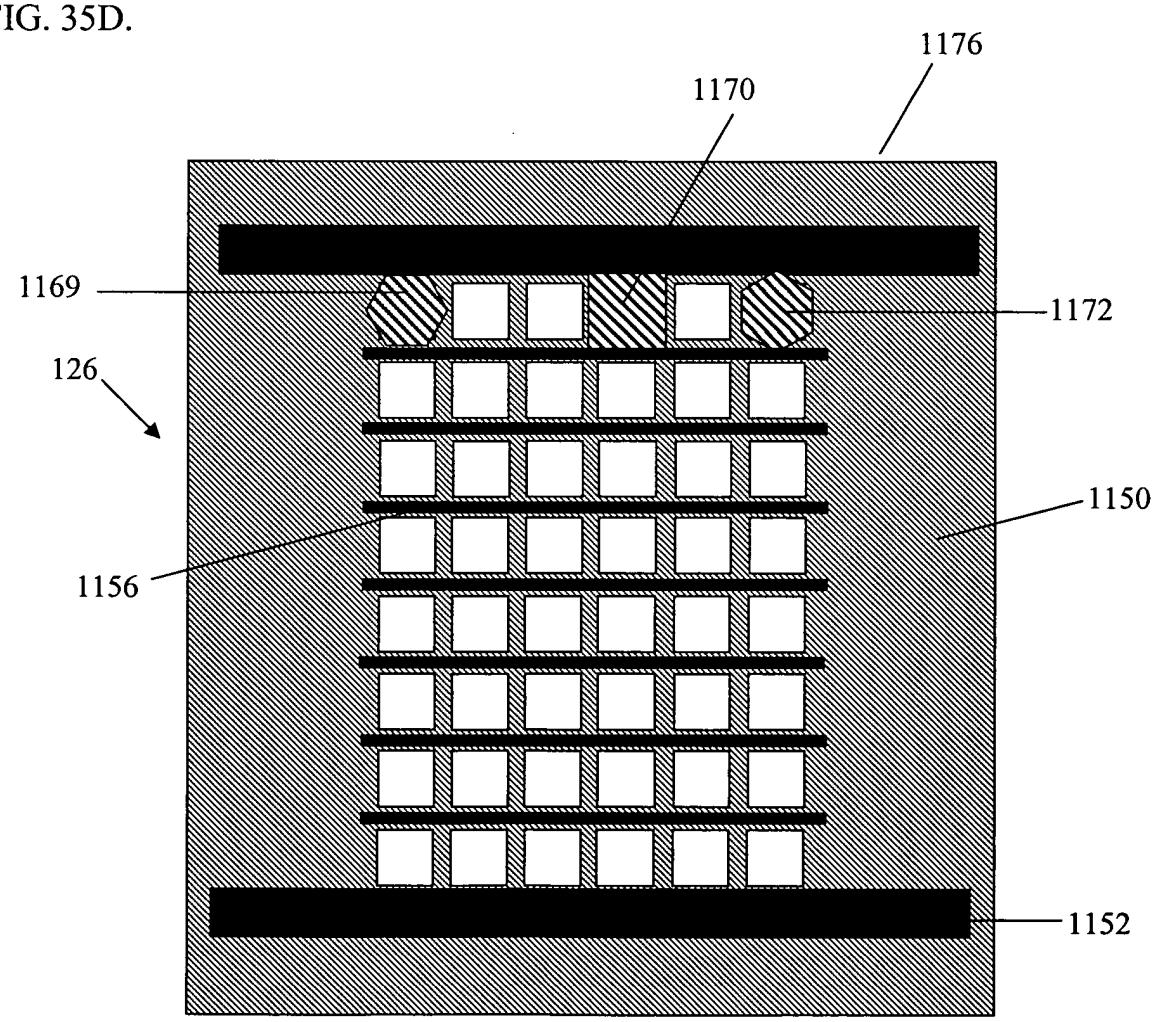


FIG. 35E.

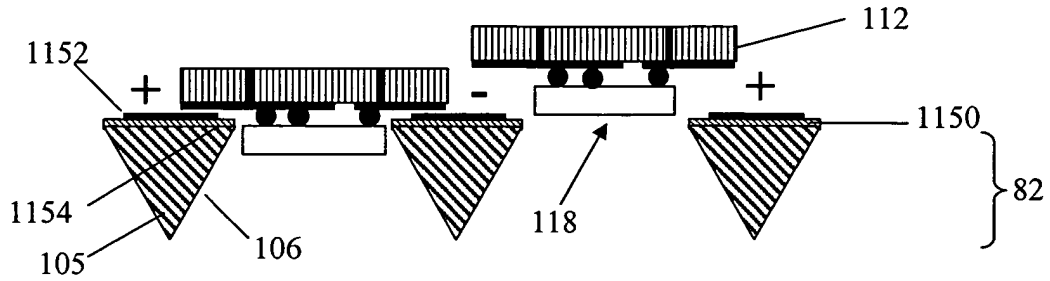


FIG. 36.

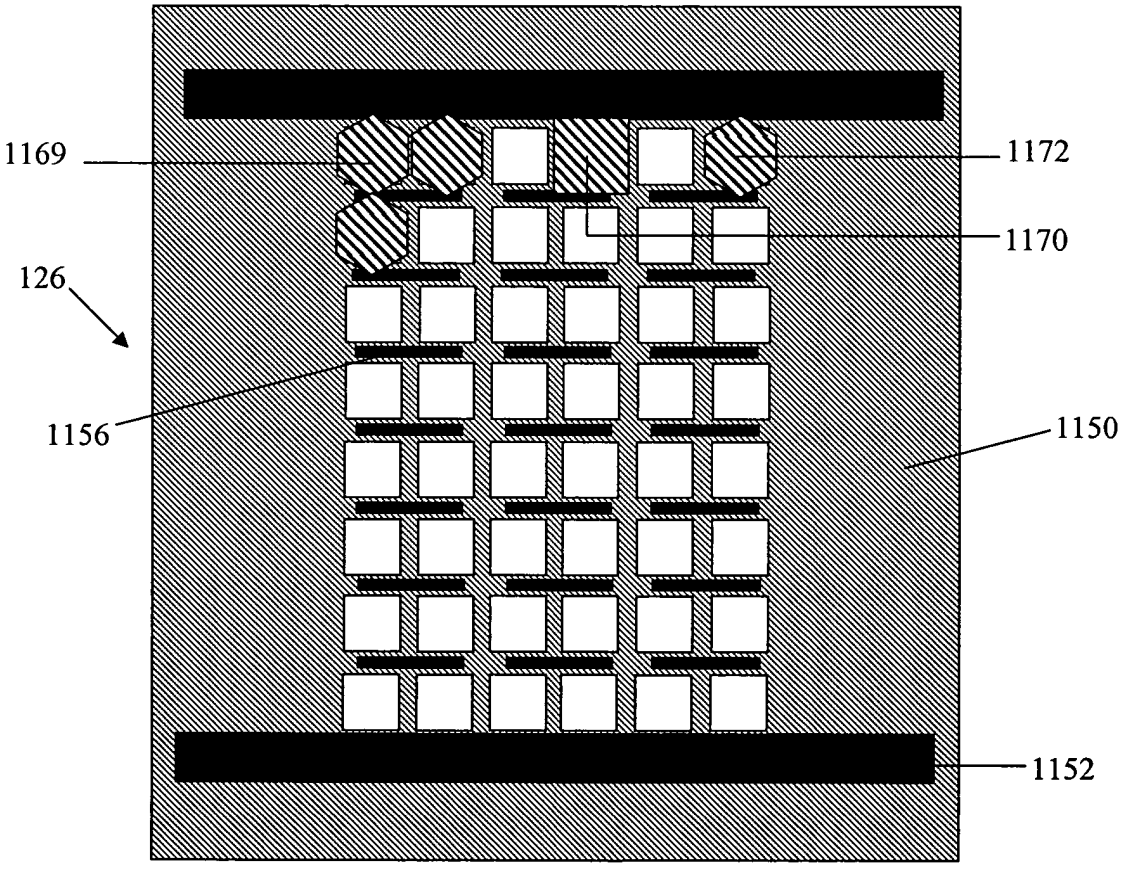


FIG. 37

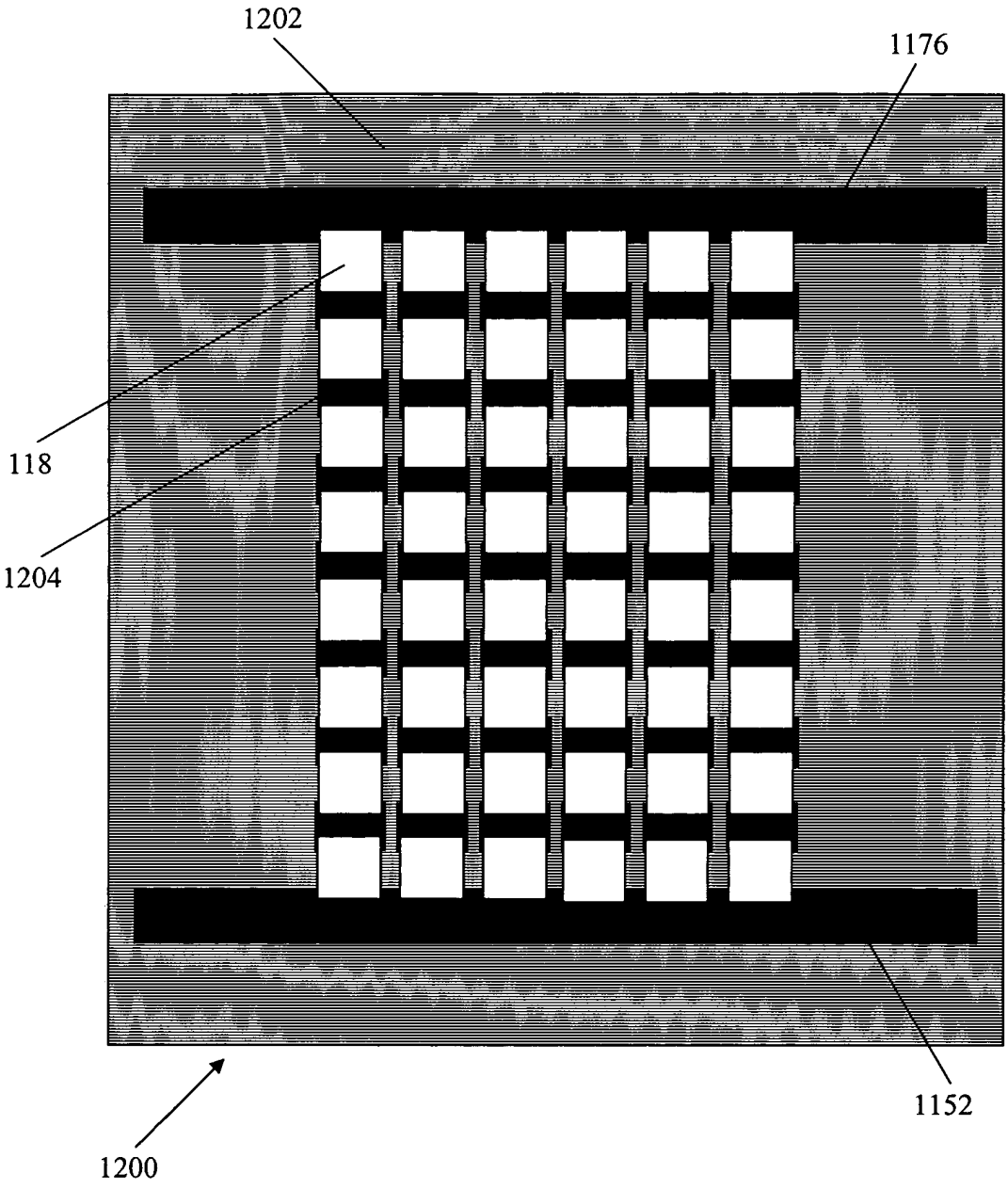


FIG. 38

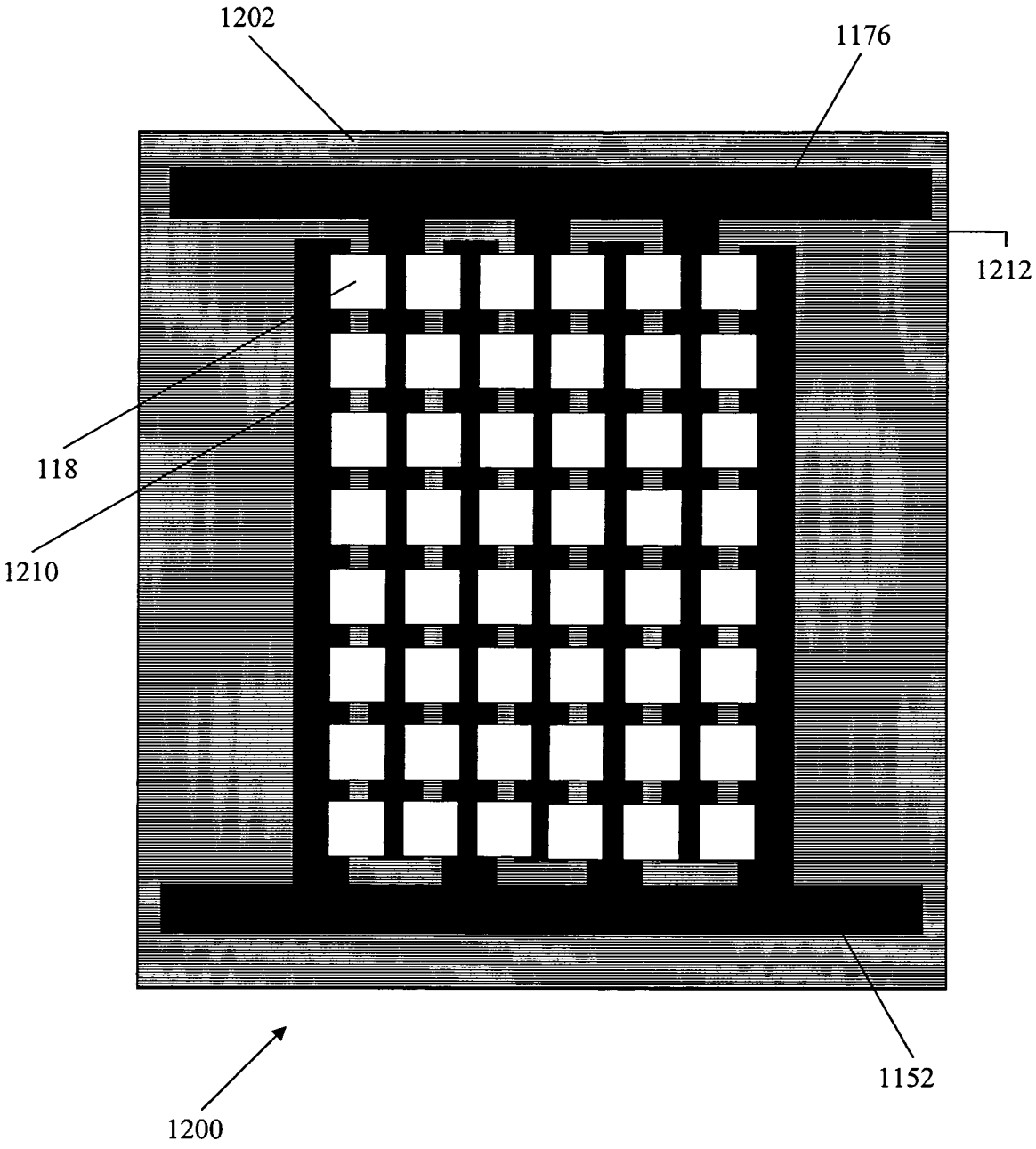


FIG. 39

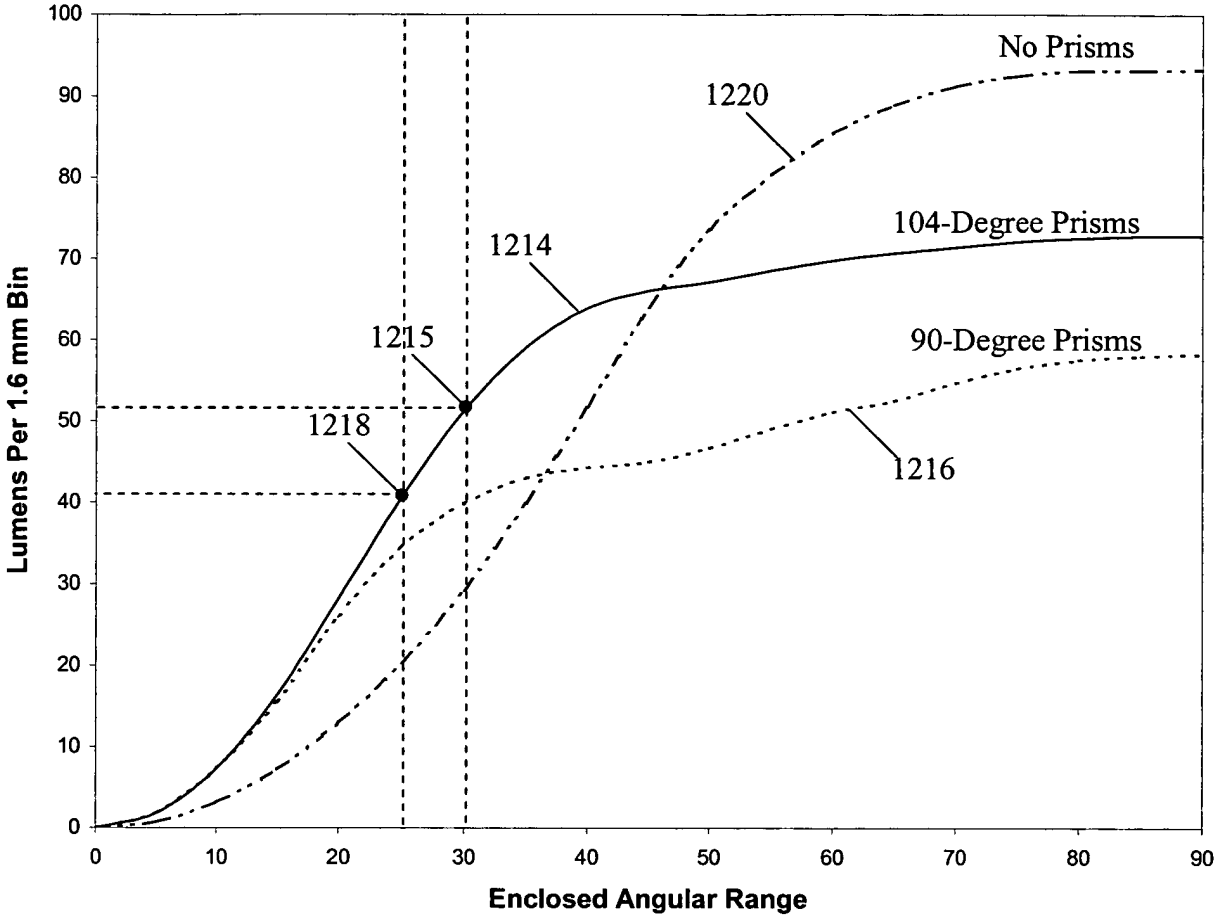

No Prisms
1220
104-Degree Prisms
1214
1215
90-Degree Prisms
1218
1216
Lumens Per 1.6 mm Bin
Enclosed Angular Range
0
10
20
30
40
50
60
70
80
90
100

FIG. 40

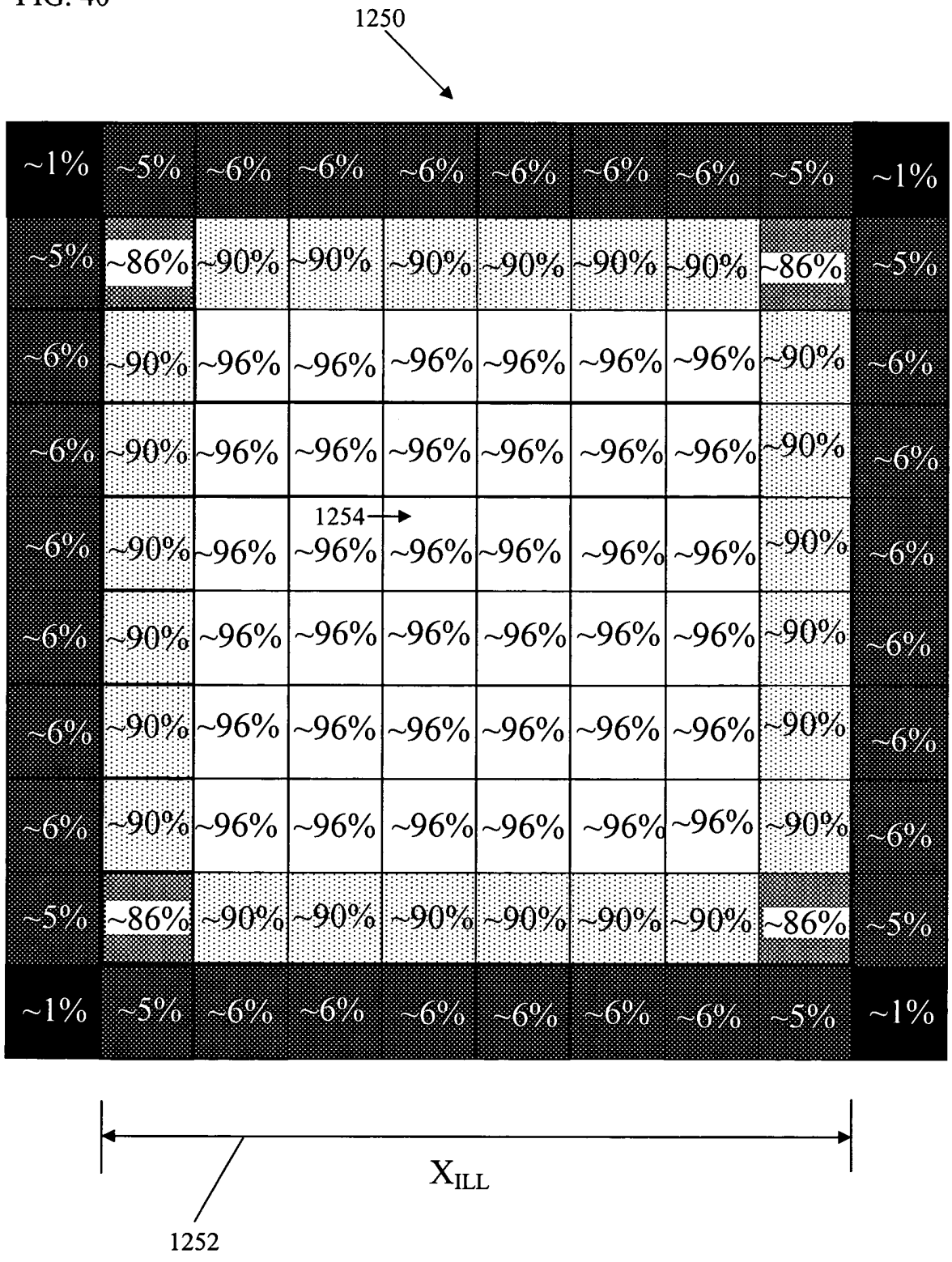

1250
~1% ~5% ~6% ~6% ~6% ~6% ~6% ~6% ~5% ~1%
~5% ~86% ~90% ~90% ~90% ~90% ~90% ~90% ~86% ~5%
~6% ~90% ~96% ~96% ~96% ~96% ~96% ~96% ~90% ~6%
~6% ~90% ~96% ~96% ~96% ~96% ~96% ~96% ~90% ~6%
1254
~6% ~90% ~96% ~96% ~96% ~96% ~96% ~96% ~90% ~6%
~6% ~90% ~96% ~96% ~96% ~96% ~96% ~96% ~90% ~6%
~6% ~90% ~96% ~96% ~96% ~96% ~96% ~96% ~90% ~6%
~6% ~90% ~96% ~96% ~96% ~96% ~96% ~96% ~90% ~6%
~5% ~86% ~90% ~90% ~90% ~90% ~90% ~90% ~86% ~5%
~1% ~5% ~6% ~6% ~6% ~6% ~6% ~6% ~5% ~1%
X_{ILL}
1252

FIG. 41A.

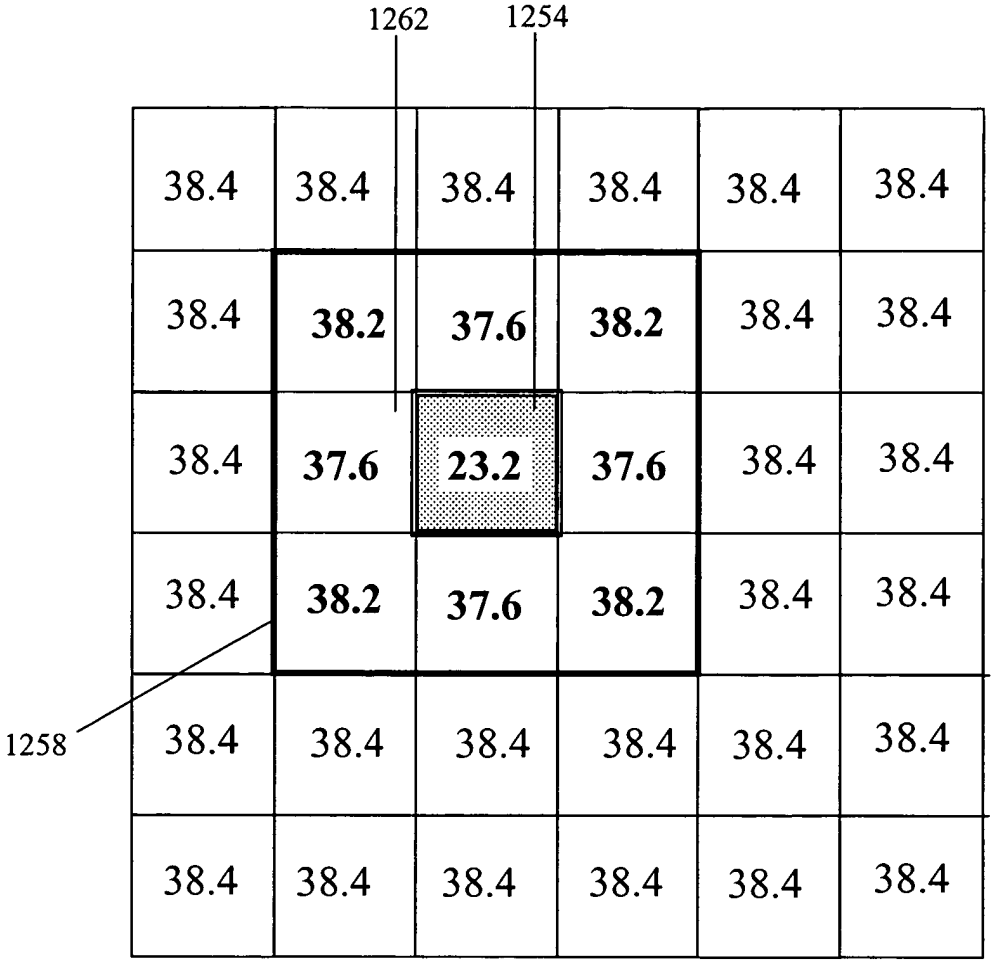


FIG. 41B.

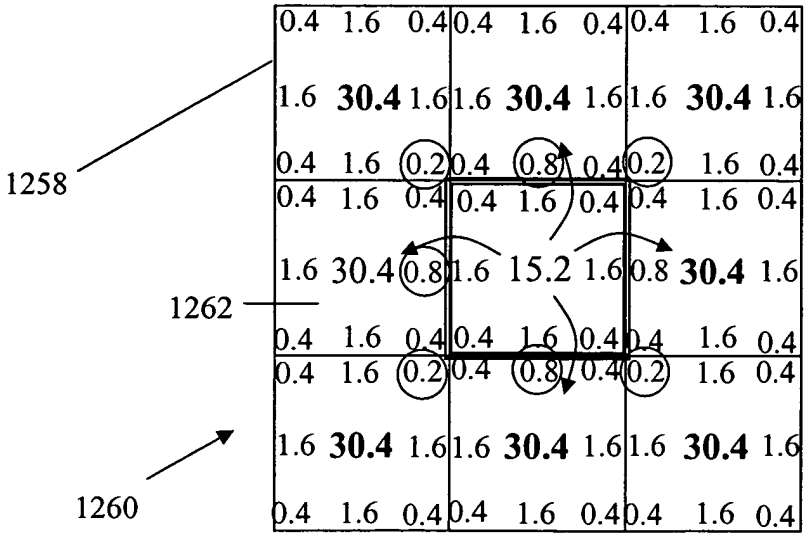


FIG. 42A.

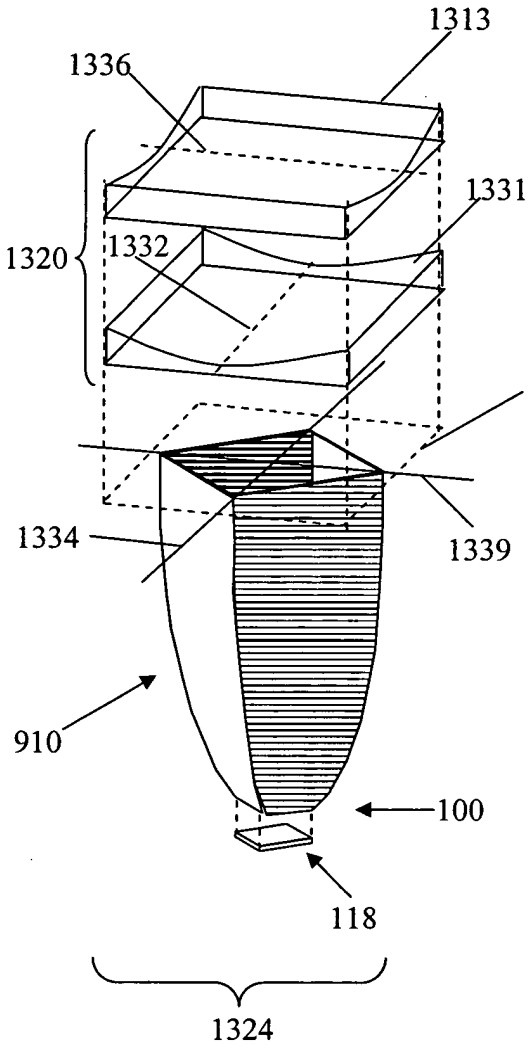


FIG. 42B.

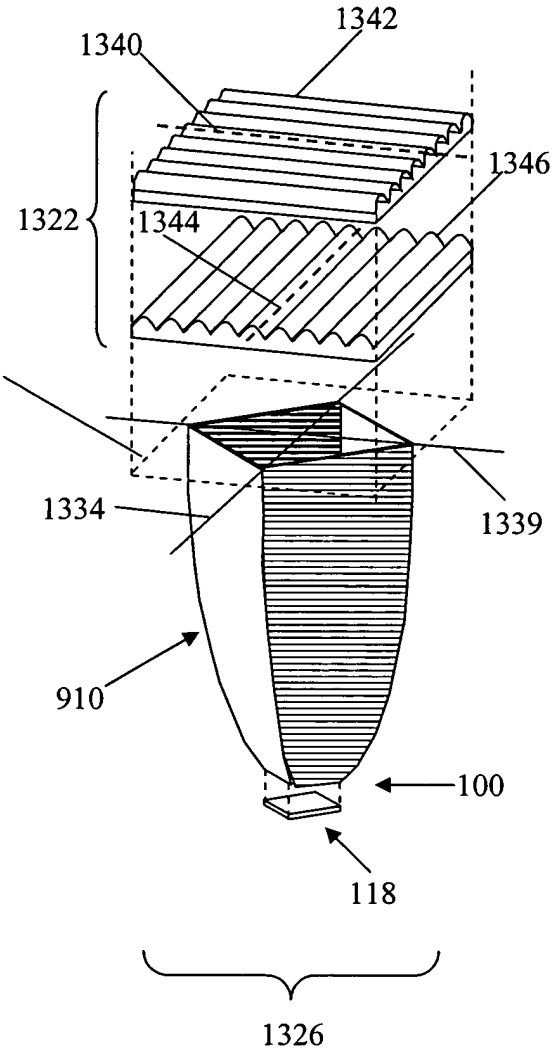


FIG. 43

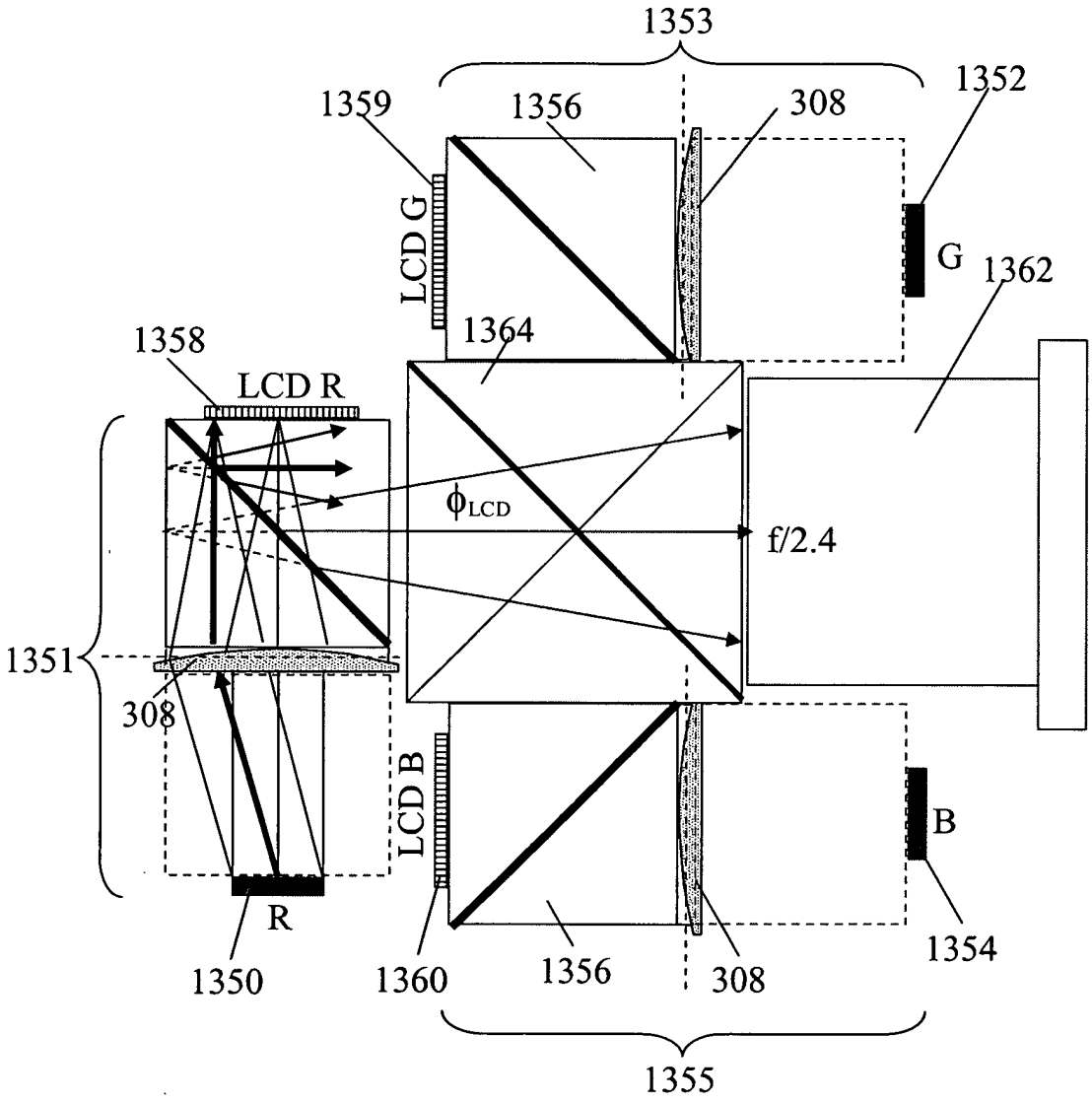

1353
1359
1356
308
1352
LCD G
G
1362
1364
1358
LCD R
ϕ_{LCD}
f/2.4
1351
308
LCD B
B
R
1354
1350
1360
1356
308
1355

FIG. 44

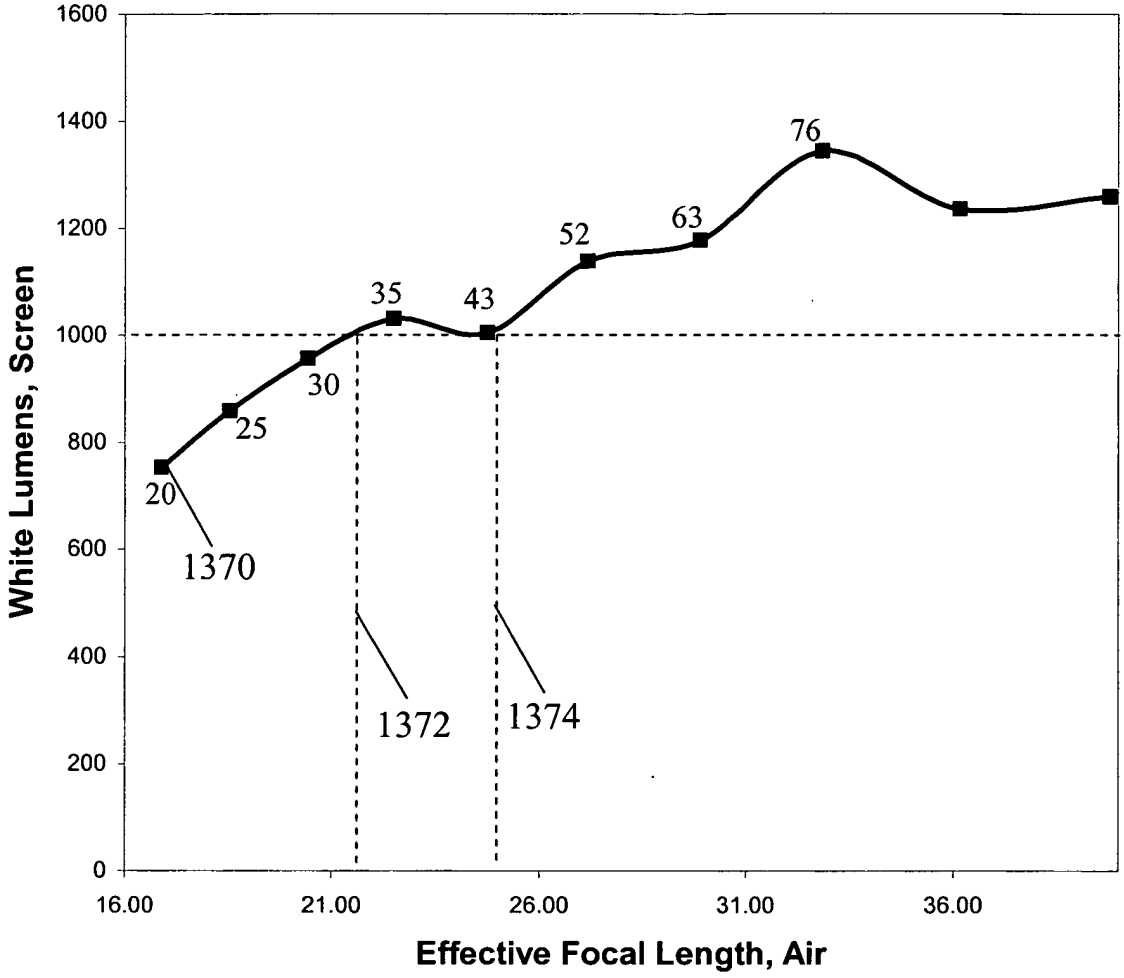

1600
1400
1200
1000
800
600
400
200
0
White Lumens, Screen
16.00
21.00
26.00
31.00
36.00
Effective Focal Length, Air
20
25
30
35
43
52
63
76
1370
1372
1374

FIG. 45

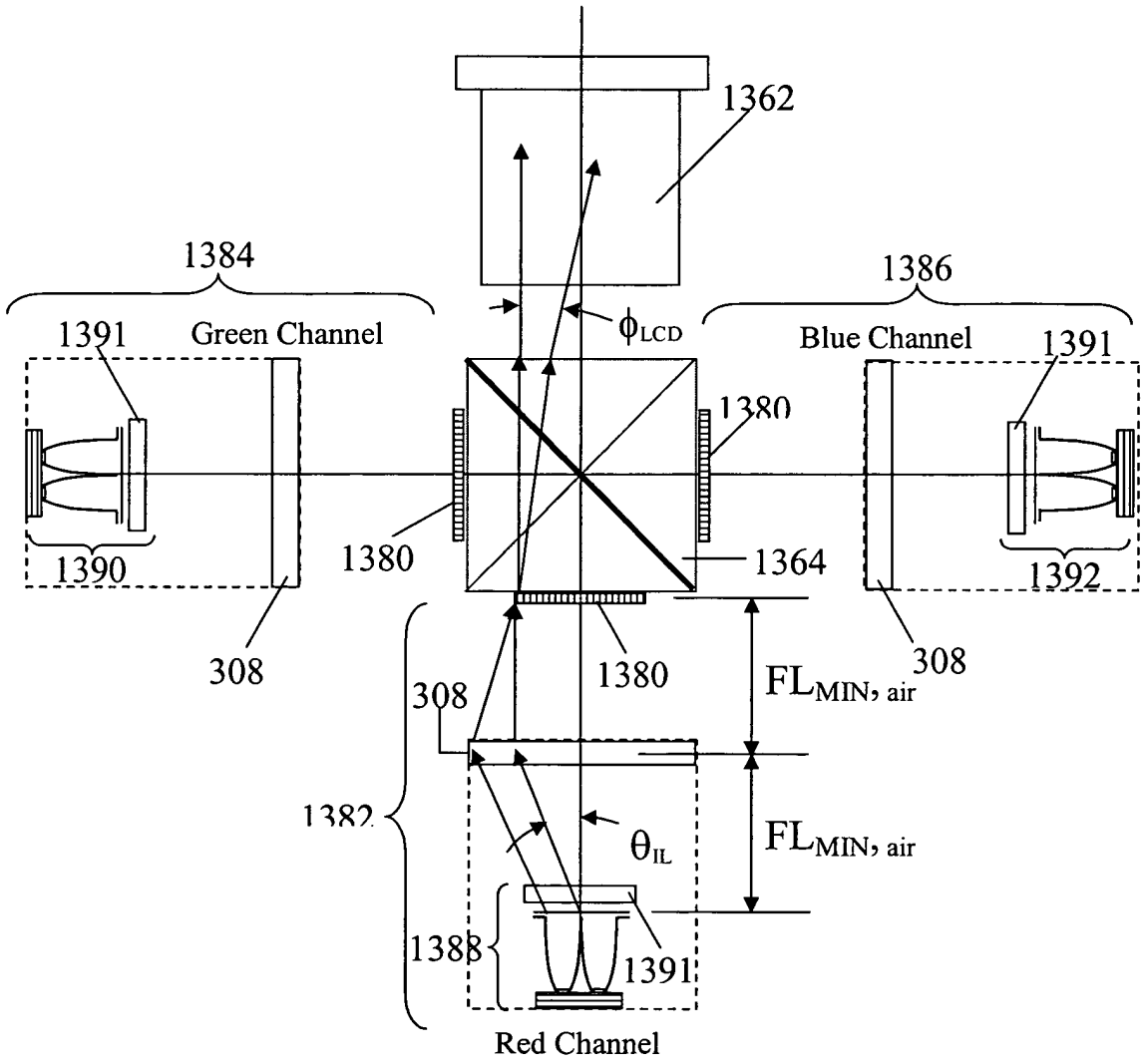
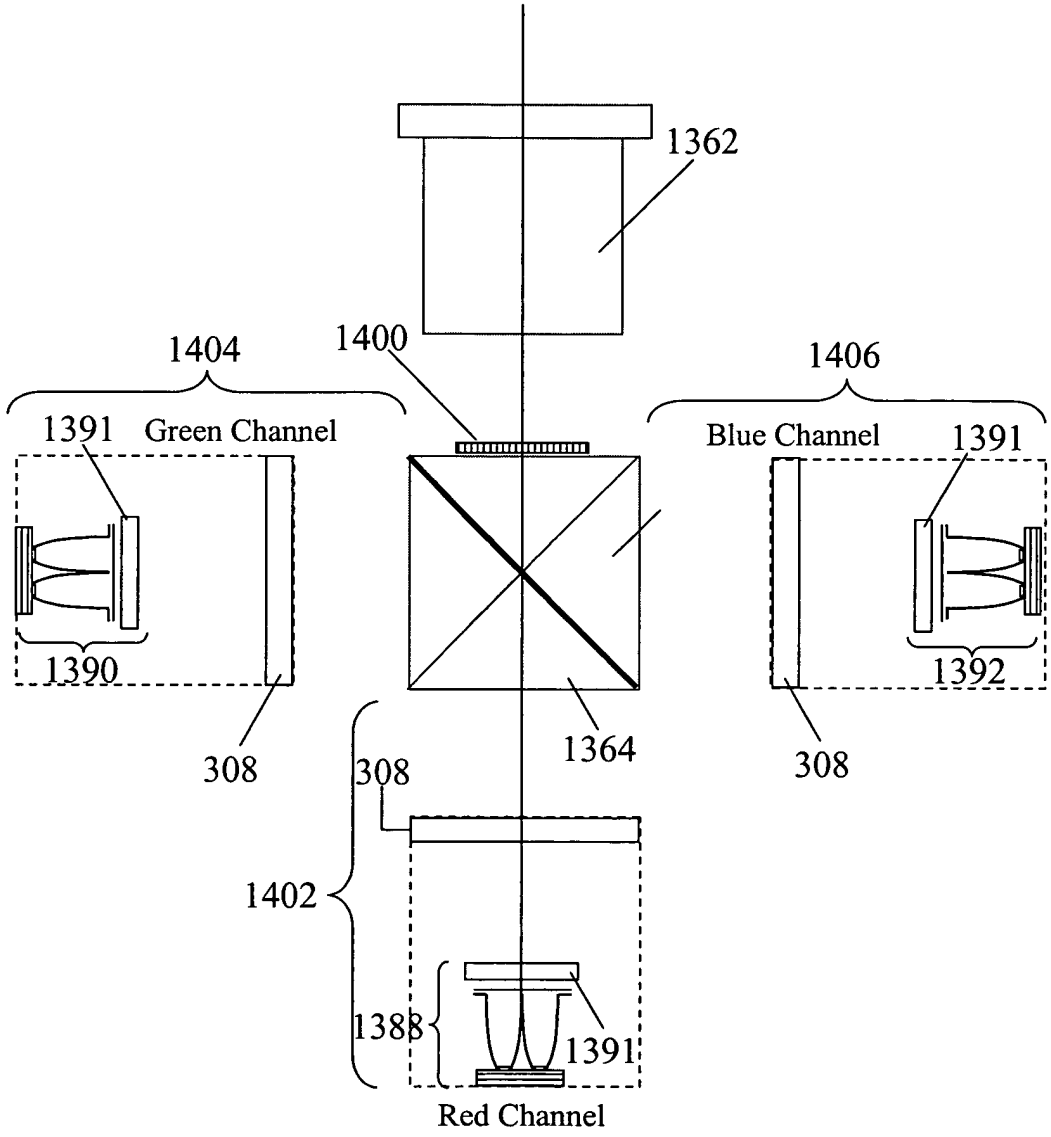

1362
1384
1386
1391
Green Channel
ϕ_{LCD}
Blue Channel
1391
1380
1390
1380
1364
1392
308
308
1380
308
$FL_{MIN, air}$
1382
θ_{IL}
$FL_{MIN, air}$
1388
1391
Red Channel

FIG. 46


1362
1404
1400
1406
1391
Green Channel
Blue Channel
1391
1390
1392
308
1364
308
308
1402
1388
1391
Red Channel